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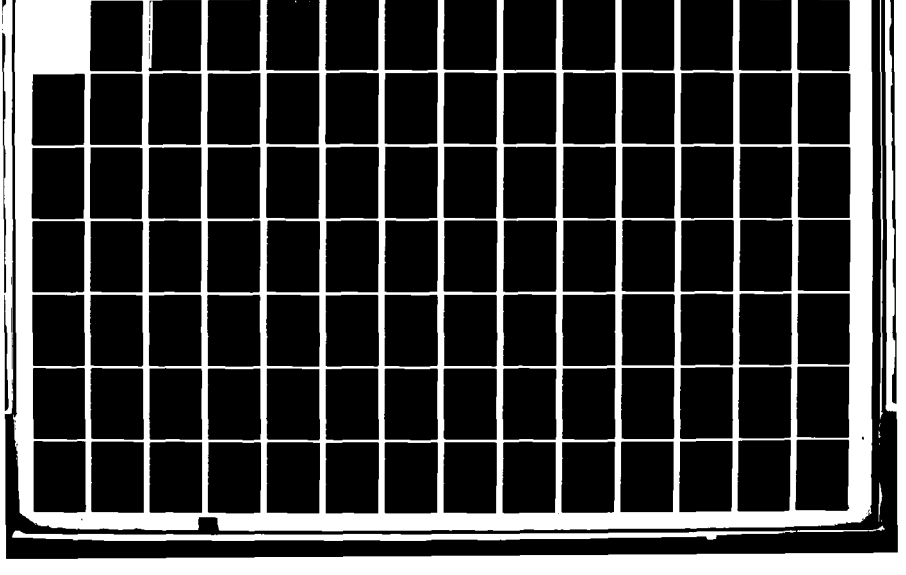

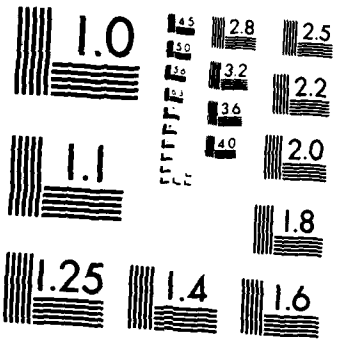

The Pennsylvania State University

The Graduate School

College of Health, Physical Education and Recreation

The Effects of Teaching Coping Strategies on the Performance of Beginning Scuba Divers

A Thesis in

Physical Education

by

Louis G. Burgess

Submitted in Partial Fulfillment
of the Requirements
for the Degree of

Master of Science

May 1983

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The effects of teaching coping strategies on the performance and anxiety of beginning scuba divers was investigated. State anxiety levels were correlated with scuba performance for both pool and open-water tasks. The effect of teaching coping strategies on cognitive and somatic aspects of anxiety was also evaluated. An experimental group (n=31) and control group (n=30) were designated using four scuba diving classes offered at Penn State. The experimental group received 15, 30 minute coping strate-

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20. sessions. Both groups were evaluated on performance during two pool tasks (4-corner station breathing and combination test) and during 2 open-water dives. Prior to each performance evaluation the subjects were administered the STAI A-state questionnaire. The STAI A-trait and CSAQ were administered during the firtst and last class attendances. Data was analyzed using ANOVR and t tests. There were no significant differences in A-state scores between good and poor divers during 2 open-water dives. The experimental group performed significantly better than the control group for the first dive only. Post hoc comparison showed that the experimental group had significantly higher A-state scores during 3 of the 4 performance tests. The control group had significant increases in both cognitive and somatic subscales of the CSAQ.

The effects of teaching coping strategies on the performance of beginning scuba divers.

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The Effects of Teaching Coping Strategies on the Performance of Beginning Scuba Divers

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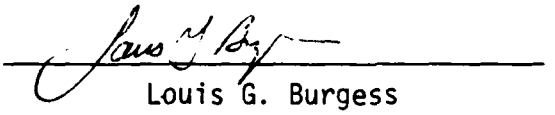

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A

ABSTRACT

This study investigated the effects of teaching coping strategies on the performance and anxiety of beginning scuba divers. In addition, state anxiety levels were correlated with scuba performance of both pool and open-water tasks. Finally, the effect of teaching coping strategies on the cognitive and somatic aspects of anxiety, as measured by the CSAQ, was evaluated.

An experimental group (n = 31) and an attention placebo control group (n = 26) were designated using the four basic scuba diving classes offered at The Pennsylvania State University during the fall 1982 term. All subjects were administered the STAI A-trait scale and the CSAQ during their second class attendance. The experimental group received fifteen, 20-minute coping strategy sessions which covered goal setting, progressive relaxation, concentration, imagery, and mental rehearsal. The attention placebo group was shown scuba related movies and received two lectures on the activities and purpose of the University sponsored dive club. Both groups were evaluated on two scuba performance tasks conducted in a swimming pool (four-corner station breathing task and a combination test), as well as during two open-water dives. Performance on the open-water dives was based on divers' respiration rates. Prior to each performance evaluation the subjects were administered the STAI A-state questionnaire. At the final class meeting, subjects were readministered the STAI A-trait questionnaire and the CSAQ.

Results showed that there were no differences in A-state scores between those divers characterized as being good and those characterized

as poor during the two open-water dives. Additionally, the experimental group had a significantly lower respiration rate than the attention placebo group for the first open-water dive. There was, however, no difference between the respiration rates of the two groups during the second dive. The experimental treatment had a significant effect on the A-state scores of the experimental group. This effect was opposite of what was hypothesized. Post hoc comparision showed that the experimental group was significantly more anxious during three of the four performance measures. The attention placebo group was less anxious for the first open-water dive, the four-corner test, and the combination test. The treatment was also found to have significantly increased the A-state variances of the experimental group. Finally, the attention placebo group showed a significant increase in both the somatic and cognitive subscales of the CSAQ. The experimental group's CSAQ subscale scores did not significantly change.

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CHAPTER I

INTRODUCTION

The relationship between anxiety and performance in high risk activities has generated great interest among researchers since the 1950's. One of the first of these studies looked at United States Army soldiers undergoing airborne training at Fort Benning, Georgia (Basowitz, Persky, Korchin, & Griniker, 1954). Among the findings of this study was that "differences from average patterns of response may be correlated with personality profiles which include evidences of the developmental origin of anxiety proneness or anxiety" (p. 290). Similarly, Fenz (Fenz, 1973; Epstein & Fenz, 1962; Fenz & Jones, 1974) has found that the performance of a sport parachute jumper is related to the way in which he/she has learned to cope with his/her anxiety about a forthcoming jump. Fenz and Jones (1974) illustrated this relationship between performance and anxiety by measuring the heart rates of 12 jumpers rated by jumpmasters as being poor jumpers and 12 top rated jumpers. The good performing skydivers demonstrated a decreasing heart rate from the time they entered the aircraft until they reached final altitude. In contrast the poor performers demonstrated a steady rise in heart rate from the time they arrived at the airport until they reached final altitude.

Several studies have been conducted using underwater divers as subjects. Radloff and Helmreich (1969) found that Sealab aquanauts who described themselves as more anxious on personality questionnaires spent less time in the water and made fewer dives than their counterparts who demonstrated lower anxiety levels. Ryman and Biersner (1975) studied Navy divers undergoing demolition training and found that those with lower

anxiety levels were, in general, more successful in completing the training, than those with higher anxiety levels. More recently, the relationship between performance in beginning scuba divers and anxiety has been studied (Griffiths, Steel, & Vaccaro, 1978, 1979, 1982; Griffiths, Steel, Vaccaro, Allen, & Karpman, Note 1; Heyman & Rose, 1980). Griffiths et al. (1979) found no relationship between anxiety and simple scuba performance tasks; however, they did find a significant relationship between anxiety and performance on more complex tasks (specifically the open-water dive required for scuba certification). Those students rated as performing highest on the open-water dives also had lower state anxiety scores, as measured by the State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, & Lushene, 1970), than those subjects rated as poor divers. Heyman and Rose (1980) found no significant relationships between anxiety and instructor ratings for pool performance. However, for the open-water dive those students who had lower anxiety made the most dives. The dives that were made were both longer and deeper than those made by students with higher anxiety scores.

Numerous methods of controlling anxiety in stressful situations and, therefore, improving performance have been tried. The general term for these methods is coping strategies. Included in the general category of coping strategies are goal setting, progressive relaxation, concentration, imagery, and mental rehearsal. Progressive relaxation has been used to help reduce anxiety and increase performance (French, 1977; Nideffer & Deckman, 1970). However, relaxation training has not been shown to be successful in increasing performance in scuba diving (Griffiths, Steel, Vaccaro, & Karpman, 1981). Griffiths et al. taught relaxation to beginning scuba divers using a biofeedback group, a

meditation group, and a control group. Diver's performance was measured in a swimming pool utilizing a timed disassembly-assembly task of an underwater puzzle consisting of 75 bolted pieces. Results of the test failed to demonstrate any significant differences in task performance between the groups.

Studies done in the area of test anxiety have shown that relaxation training is not effective by itself as a coping mechanism (Davison, 1968; Lang, Lazorik, & Reynolds, 1965; Rachman, 1968). This is explained in part by Davidson and Schwartz's (1976) analysis of anxiety, which breaks it down into two dimensions: the cognitive and somatic components of anxiety. It has been found that relaxation training works on the somatic manifestations of anxiety; whereas, mental mediation such as imagery or mental practice affects the cognitive aspects of anxiety (Decaria, 1977; Schwartz, Davidson, & Goleman, 1978).

Imagery and mental rehearsal have also been used in various athletic settings to facilitate performance (Decaria, 1977; Griffiths, Steel, Vaccaro, Allen, & Karpman, Note 1; Griswold, Note 2; Seaborne, Weinberg, & Jackson, Note 3). Griffiths et al. used four 30-minute taped programs which included one segment dealing with mental practice. Those divers participating in the taped program showed significantly better performance for a bail-out test, as well as lower state anxiety scores for the bail-out test and an open-water dive. While the use of coping strategies to control anxiety and to facilitate performance has been well documented in the area of recreation and sports (Martens, 1977; Nideffer, 1976), the use of live instruction versus taped procedures has been shown to have greater efficacy of results (Bernstein

& Borkovec, 1973; Lehrer, 1982). If this is so then a "live" presentation of relaxation procedures and other coping strategies will have greater impact on the performance and anxiety levels of beginning scuba divers.

Statement of the Problem

The purpose of this study was to determine the effectiveness of teaching various coping strategies (goal setting, progressive relaxation, imagery, mental rehearsal, and concentration) on the performance of beginning scuba divers in two open-water dives. In addition, the effectiveness of teaching coping strategies on the performance of two pool training tasks (four-corner station breathing and the combination test) was to be determined. A subproblem was to determine the effect of the treatment on state anxiety, as measured by the State Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, & Lushene, 1970), and to correlate state anxiety with scuba performance for both pool and open-water tasks. Finally, the effect of teaching coping strategies on the cognitive and somatic aspects of anxiety, as measured by the Cognitive Somatic Anxiety Questionnaire (CSAQ) (Schwartz, Davidson, & Goleman, 1978) was determined.

Hypotheses

1. Divers who perform best doing the open-water dive, as measured by respiration rate, will possess lower A-states than those divers who do poorly or fail to complete their open-water dive.

2. There will be no difference between the experimental treatment group and the attention placebo group in the performance of practical scuba tests conducted in a swimming pool.

3. The group which receives the coping strategy treatment will demonstrate better performance, as measured by lower respiration rates, during the open-water dive than the attention placebo group.

4. The state anxiety levels for both groups of beginning scuba divers will be higher prior to the open-water dive than in a swimming pool environment.

5. The experimental treatment group will show a decrease in both cognitive and somatic manifestations of anxiety as measured by CSAQ, when comparing pre- and post-treatment scores.

6. The group that receives the treatment will have a higher basic scuba course certification rate than the attention placebo group.

Delimitations

This study is delimited to male and female students at The Pennsylvania State University between the ages of 18-23 enrolled in the Basic Instructional Program scuba classes in the fall 1982 term.

Definitions

Four-corner station breathing task: a scuba skills test where an air tank with regulator is placed in each corner of the diving well. The student is required to swim to each corner of the pool in a circular pattern obtaining air only from the tank in each corner. The student is required to make three complete trips, once in each of the following conditions: mask and fins, fins only (no mask), and black-out mask and

fins. The diver's score is the total number of tanks from which air is received.

Combination test: a timed exercise where the student is required to swim lengths in a 25-yard pool in the following conditions:

1) Buddy breathing (two divers sharing one air regulator)--four lengths
2) Snorkel (diver wears full equipment, but snorkel is only source of air)--four lengths
3) Scuba--four lengths
4) Swim (no equipment--scuba gear is ditched at bottom of pool)--two lengths
5) Carry-gear on bottom (diver carries all scuba gear)--two lengths
6) Scuba--two lengths (diver must don all equipment)

Respiration rate: the number of breaths per minute taken by a scuba diver while under water.

Open-water dive: one of two scuba dives conducted at Stone Valley Recreation Area. The first dive is a familiarization dive and is conducted in depths of up to 15 feet. The second open-water dive is the certification dive and it is conducted in depths of up to 30 feet of water.

State Anxiety (A-state): a transitory emotional state characterized by subjectively, consciously perceived feelings of apprehension and tension (Spielberger, 1966). The STAI Form X-1 was used for assessment. Scores range from 20-80, with a mean for college-aged students at 36.35.

Trait Anxiety (A-trait): a relatively stable personality trait characterized by a disposition to perceive objectively non-threatening situations as dangerous and to react to them in a manner disproportionate to their actual degree of danger (Spielberger, 1966). The STAI Form X-2 was used to determine trait anxiety. Scores range from 20-80, with a mean for college-aged students at 37.68.

Somatic Anxiety: symptoms of anxiety that are experienced in the body. The somatic subscale of the CSAQ provided the somatic scores. Scores range from 0 to 63.

Cognitive Anxiety: symptoms of anxiety that exist inside a person's head. Cognitive anxiety can consist of unwanted negative thoughts, worries, the inability to concentrate, or the inability to prevent the mind from considering the negative side of past or future situations. It is measured by the cognitive subscale of the CSAQ, with scores ranging from 0 to 63.

Limitations

1. University students were assigned to Basic Instruction Program scuba classes by computer, based on student preferences. This could result in nonequivalent groups.

2. Basic Instruction Program scuba classes at The Pennsylvania State University were taught by three different instructors, utilizing the same program of instruction.

3. There was no control over external events which could have affected the subjects' reported anxiety levels.

CHAPTER II

REVIEW OF LITERATURE

The purpose of this study was to look at the effects of teaching coping skills and strategies on the performance and anxiety of students enrolled in a beginning scuba course. State anxiety levels were correlated with scuba performance measures of both pool and open-water tasks. In addition, the effect of the coping strategy treatment on the cognitive and somatic aspects of anxiety, as measured by the Cognitive-Somatic Anxiety Questionnaire, was evaluated. This review of literature will be structured as follows: a) high risk activities and anxiety, b) State-Trait Anxiety Inventory, c) Cognitive-Somatic Anxiety Questionnaire, and d) treatment.

High Risk Activities and Anxiety

The great interest in the study of anxiety has resulted in thousands of published studies since 1950 (Martens, 1971). A large number of these studies were conducted with short lived and generally artificial laboratory situations or with chronically anxious patients. There are sufficient activities and situations available in today's world which provide a stressful environment and will produce anxiety in people. One of the first studies conducted in a field setting utilizing such a high risk situation was by Basowitz, Persky, Korchin, and Grinker (1954). In an effort to study the behavior of normal individuals in a difficult and psychologically meaningful life situation, United States Army soldiers undergoing basic airborne training at Fort Benning, Georgia, were chosen as subjects. The training requirements of jumping

numerous times out a 34-foot training tower (a simulation of jumping into and falling through space), dropping from a 250-foot tower with a pre-deployed parachute, and making five jumps from a military aircraft provided situations which involved real or at least potential threats to life for which subjects were unprepared by past experience. Basowitz et al. found no significant differences among men that passed or failed in the training. However, a general finding was that those soldiers unable to earn their jump wings "showed a greater disturbance, both psychologically and somatically, in the test measures" (p. 279). In addition, the soldiers that failed, performed less than adequately throughout the period of training. Another finding from the Basowitz et al. study showed that "differences from average patterns of response may be correlated with personality profiles which include evidences of the developmental origin of anxiety proneness or anxiety" (p. 290).

In a number of studies involving sport parachutists, Fenz (Epstein & Fenz, 1962; Fenz, 1964, 1973; Fenz & Jones, 1972, 1974) explored coping mechanisms and performance under stress. Fenz's studies have shown that participants in the high risk sport of skydiving demonstrate important differences in physiological patterns between better and poorer performers. Initially, Fenz and his colleagues surmised that the fear from a stressful event, such as skydiving, would eventually become extinguished as the beginner gained experience and knowledge. In fact this prediction was not the case. Beginners and experienced jumpers both went through moments of self-doubt, fear, and even panic prior to a jump. However, the experienced jumpers were able to control these feelings and perform in a superior manner.

Fenz and Jones (1974) selected 12 jumpers receiving the highest rating from two expert jumpmasters as well as 12 jumpers receiving the lowest ratings. They then measured their heart rates at seven points prior to exiting the aircraft (e.g., upon arrival at airport, upon boarding the aircraft, at 1,000 feet, during jump run) as well as in a laboratory setting. The results supported the findings of Fenz's earlier studies in that both groups showed an increase in heart rate from arriving at the airport until boarding the aircraft. At this point the heart rate for the poorer jumpers continued to climb; whereas, the good jumpers demonstrated a steady decline with heart rate at only slightly elevated above baseline at the time of the jump. Laboratory testing showed that there was no absolute differences between the good and poor performers in terms of heart rate.

A difference of anxiety levels between good and poor performers has also been found with deep sea divers (Radloff & Helmreich, 1969). In this study, utilizing Sealab aquanauts as subjects, divers who characterized themselves as more anxious on personality tests spent less time diving during their stay under the water. The Sealab divers considered themselves to be under constant danger from sudden death. Not only did the divers have to breath compressed gases, some of which dissolves into the joints and bloodstream, making decompression necessary before return to the surface, but they had to contend with poor visibility and poisonous scorpion fish. Egstrom and Bachrach (1971) noted that situations, such as those described, have led to overwhelming levels of anxiety among divers, which in turn may lead to panic, thus causing an increase in underwater accidents.

In an effort to better understand the relationship between anxiety and performance in scuba diving several studies have been conducted (Griffiths, Steel, & Vaccaro, 1978, 1979, 1982; Griffiths, Steel, Vaccaro, & Karpman, 1981; Griffiths, Steel, Vaccaro, Allen, & Karpman, Note 1; Heyman & Rose, 1980, Note 4). Griffiths et al. (1978) utilized 29 male college students enrolled in beginning scuba classes to determine the relationship between anxiety levels at rest and prior to their underwater training. He utilized the STAI (Spielberger, Gorsuch, & Lushene, 1970) to measure A-state and A-trait of the students. A-state was measured immediately prior to three underwater tests (buddy breathing, bail-out, and a quarry dive). The results indicated the resting A-state and A-trait means of the scuba students were significantly lower than A-state and A-trait norms. The A-state scores for the quarry dive was the only state score which was significantly higher than the resting A-state scores.

Griffiths and his colleagues conducted an additional study (Griffiths, et al., 1979) to determine the relationship between anxiety and performance. The STAI was again used to determine anxiety levels. A-state was measured in a classroom situation as well as before each of four tests. The tests were: 1) skin diving proficiency, 2) buddy breathing, 3) bail-out, and 4) deep water quarry dive. The first three tests were conducted in a pool and all tests were evaluated by YMCA scuba instructors. There was no relationship between performance and anxiety for the first two single tasks. The bail-out, the most complex task in the pool environment correlated significantly with both trait and state anxiety ($p < .02$, $r = -.320$ and $p < .001$, $r = -.461$). "The

results suggest that there is no relationship between anxiety and performance on relatively simple tasks, while they are significantly related on more complex diving maneuvers" (Griffiths et al., 1979, p. 1009).

Heyman and Rose (1980) studied the relationship of personality and behavioral characteristics with the scuba performance of novices. They administered a number of personality questionnaires (including the STAI) to university students enrolled in a university sponsored scuba course. These tests were then compared with instructor ratings and open-water dive performance (including depth and duration of dive). Results of the STAI showed the students to be lower in both state and trait anxiety levels when compared to Oklahoma State University norm groups. There were no significant relationships between anxiety and instructor ratings for pool performance. For the open-water dive those students who had lower anxiety scores for both A-state and A-trait made the most dives, and the dives that they made were both deeper and longer than those made by students with higher trait anxiety scores.

A more recent study was conducted by Griffiths, Steel, Vaccaro, and Karpman (1981) to investigate the effects of relaxation techniques on anxiety and underwater performance. In that experiment, subjects were randomly assigned to a bio-feedback group, a meditation group, or a control group. The STAI was administered, and some physiological measures were taken (heart rate, respiration rate, hand temperature, and tonic frontalis muscle tension level) in order to compare them to performance on a special underwater task (the United States Navy's "Sp^2 assembly task") conducted in a pool. Results of the study showed that the two groups utilizing relaxation techniques had lower A-states

upon completion of the treatment. Significant correlations were found between A-state and A-trait ($p < .05$) on performance. There was no distinction between any of the three groups in terms of performance. Griffiths et al. stated that part of the reason for this finding was that anxiety levels were never substantially raised while working in the closed environment of a swimming pool. It was also found that the STAI was more sensitive to anxiety changes than any of the physiological measures.

As a result of the lack of significant findings on the effect of various relaxation techniques on scuba diving performance, Griffiths et al. (Note 1) conducted a study utilizing a specially designed audio-cassette tape program. The tapes were designed to reduce diver stress and enhance underwater performance. The tapes covered the causes, symptoms, treatments, and preventions of diver stress. In addition, there was a tape which emphasized deep breathing exercises "which induce relaxation, most notably the 'calming response', which combines diaphragmatic breathing and autogenic training" (Griffiths et al., Note 1, p. 2). The last tape used described cognitive rehearsal and mental practice of specific scuba diving skills. The class which received the special tape program was compared to a control class in terms of state and trait anxiety as well as performance. Performance was evaluated by specially trained independent instructors as well as by use of respiration rates. Griffiths et al. found that divers listening to the tape program reported s gnificantly lower ($p < .05$) levels of state anxiety for the bail-out test ($36.82 < 40.41$) in the pool as well as prior to the open-water dive ($30.19 < 36.41$) when compared to a control group.

In addition, it was found that the group listening to the tapes performed significantly better ($p < .001$) on the bail-out task. Griffiths et al. concluded that the specially designed scuba tapes which combined relaxation skills, breathing exercises, and cognitive rehearsal skills "will provide a valuable, supplemental aid to scuba diving instruction in the future" (Griffiths et al., Note 1, p. 3).

State-Trait Anxiety Theory

Expanding on work done by Cattell (1961), Spielberger (1966) developed a state-trait anxiety theory with which he hoped to eliminate the ambiguity and confusion in theory and research regarding the concepts of stress and anxiety. In his theory he differentiated between state anxiety and trait anxiety. State anxiety refers to a transitory condition of a subject that varies in intensity and fluctuates over time. Spielberger also defines anxiety as a personality trait: trait anxiety. This refers to the "relatively stable individual differences in anxiety proneness as a personality trait" (Spielberger, 1972, p. 482). The State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, & Lushene, 1970) was developed in order to measure both types of anxiety. State anxiety is measured using the A-state portion of the STAI. This scale consists of 20 descriptive statements that require the subjects to indicate how they feel (not at all, somewhat, moderately so, very much so) at a particular moment in time. Trait anxiety is measured in a similar manner. Subjects answer 20 items (e.g., "Some unimportant thought runs through my mind and bothers me.") using a four-point scale (1 = almost never, 2 = sometimes, 3 = often, and 4 = almost always). The individuals describe each item with how they generally feel.

The STAI has been utilized to measure anxiety levels with runners (Tooman, 1982), rifle shooters (Doyle, 1981), as well as scuba divers (Griffiths et al. 1978, 1979, 1982; Heyman & Rose, 1980, Note 4). Griffiths et al. (1981) found that the STAI was more sensitive to anxiety changes than any of the physiological measures used in his study. The STAI has been endorsed as the most complete instrument for measuring anxiety.

> Among these scales Spielberger's STAI possesses the most impressive credentials and is the only one constructed which assesses state and trait anxiety with separate scales. The STAI has been carefully developed from both theoretical and methodological standpoints. The trait anxiety scale has good test/retest reliability and the state shows good internal consistency. (Martens, 1971, p. 172)

The test/retest reliability was assessed by readministering the inventory to undergraduate college students after periods of one hour, 20 days, 15 weeks. Correlations for the A-trait scale ranged from .73 to .83. Coefficients for the A-state scale was lower (.16 to .54) but reflect the transient nature of state anxiety. The reliability of the STAI was determined by administering the test under stressful as well as relaxing conditions. Alpha reliability coefficients from the stress conditions were .92 and .94, while the coefficient for the relaxed condition was .89.

The concurrent validity of the A-trait scale was determined by correlating it to other A-trait measures. The A-trait scale was highly correlated to both the CPAT Anxiety Scale and the Taylor Manifest Anxiety Scale. The correlations ranged between .75 and .85. The construct validity of the A-state scale was determined by giving undergraduate college subjects the test under two differing conditions. First

the test was administered following the standard instruction. Second they were instructed to indicate how they would feel prior to an important final exam. The average anxiety scores were higher in the exam condition for both males and females.

Cognitive-Somatic Anxiety Questionnaire

The Cognitive-Somatic Anxiety Questionnaire (CSAQ) was developed by Schwartz, Davidson, and Goleman (1978) in order to further enhance the psychobiological analysis of anxiety. A multi-dimensional approach to anxiety has been proposed by a number of researchers (Barrett, 1972; Borkovec, 1976, Davidson & Schwartz, 1976; Hodgeson & Rachman, 1974; and Spielberger, 1966). Barrett (1972) performed an item analysis of a number of commonly used anxiety scales, including the STAI, and found two major categories of anxiety. There was an awareness of somatic changes as well as a "conscious awareness of unpleasant feelings about self or external stimuli" (Barrett, 1972, p. 202). As a result of their own research and reviewing the literature of the multi-dimensional nature of anxiety, Schwartz et al. developed the CSAQ. The 14 items on the questionnaire were chosen by three independent judges as best reflecting cognitive or somatic anxiety. There are seven questions concerning each type of anxiety. Subjects rate the degree to which they generally or typically experience a symptom when they are feeling anxious by marking a five point Likert scale. A 1 represents "not at all" and 5 represents "very much so." An example of a cognitive anxiety item is "Some unimportant thoughts run through my mind and bother me." An example of a somatic item is "I feel tense in my stomach." Doyle (1981) used the CSAQ to evaluate the cognitive and

somatic aspects of anxieties in shooters attending a Junior Olympic shooting camp. She concluded that "the CSAQ seems best suited to measuring the subcomponents of anxiety" (p. 75). The validity of the CSAQ as a measure of trait anxiety was established by correlating it to the A-trait portion of the STAI. The correlations of both the cognitive and somatic scales of the CSAQ with the STAI were both highly significant (r = .67 and .40, respectively, $p < .0001$).

Treatment

The ability to control anxiety in stressful situations and to maintain or improve performance is a desirable asset for an individual. This ability to cope with differing situations is not an innate quality but can be taught using stress management techniques, often called coping strategies or coping skills. Coping strategies can be differentiated from other stress management techniques by "their emphasis on helping the client to develop a repertoire of skills that will facilitate adaption in a variety of stress situations" (Mahoney & Arnkoff, 1978, p. 707).

Progressive relaxation training (Jacobson, 1938) has been used for a number of years as a coping strategy for numerous disorders. Traditionally this treatment has been used to work on such target behaviors as insomnia, childhood asthma, hypertension, tension headaches, and phobias. Wolpe (1958) developed a more efficient relaxation program which sharply reduced the amount of time spent in training. Later Wolpe (1969) developed a program called systematic desensitization, which first taught subjects to relax and then asked them to imagine anxiety provoking situations. The reasoning behind this program

was that the arousal and relaxation were incompatible responses, and thus anxiety was dissipated. As noted by Bernstein and Borkovec (1973), there have been great advances in the training conditions for relaxation. Nonetheless, they feel that one of the more important requirements for successful relaxation training is to have intelligent coping subjects who know that such training "may be used within the therapy situation or it may be used in the extra-therapy environment as a response with which to deal with stressful situations" (p. vii).

In a review of progressive relaxation as a treatment intervention, Borkovec and Sides (1978) found that many variables influence the effectiveness of relaxation training. "The most fundmanetal issue in relaxation training, then, is whether or not progressive relaxation does indeed produce physiological reduction effects and, if so, under what specific procedural conditions" (p. 119). Borkovec and Sides' conclusion was that to ensure best results in reducing physiological measures of stress, studies should use "multi-session, live training with subjects for whom there is a relevant physiological response component in the target behavior" (p. 124). The issue of live versus taped relaxation training has been reviewed by numerous authors (Borkovec & Sides, 1978; Lehrer, 1982). Direct comparison of these two methods generally found the live instruction to be superior (Godsey, 1979; Paul & Trimble, 1970; Qualye, 1979). Borkovec and Sides (1978) concluded that tape-recorded training is not effective as a relaxation technique.

Relaxation techniques have also been used to reduce anxiety and stress prior to physical activities (French, 1977; Nideffer & Deckman, 1970; Griffiths et al., 1981). The case study done by Nideffer and

Deckman used progressive relaxation on a shot putter thought to have reached his peak as a performer. After being trained on the techniques, the performer increased the distance of his best throw by four feet. Griffiths et al. (1981) randomly assigned college students enrolled in beginning scuba diving classes to one of three groups (a bio-feedback group, a meditation group, or a control group). They administered the STAI to gain baseline measures of self-reported state and trait anxiety. Over a period of six weeks all groups listened to taped relaxation instructions. The bio-feedback group listened to a tape emphasizing muscle relaxation, the meditation group listened to a tape on standard meditation techniques, and the control group listened to a tape devoid of any meaningful relaxation training. As previously mentioned the results showed that the A-states for the two relaxation groups were significantly lower than that of the control group. However, performance on the complex task (disassembly and reassembly of an underwater puzzle consisting of 75 bolted pieces within a specific time limit) between the three groups was not significantly different.

In addition to progressive relaxation training there are a number of additional coping skills or strategies which have been utilized specifically to enhance performance. Included in this category is imagery, mental practice, goal setting, and concentration.

Imagery, in relation to athletics has been defined by Richardson (1967) as being the symbolic rehearsal of a physical activity in the absence of any gross muscular movements. Mental practice and its effect on performance has been investigated by numerous investigators. One of the first studies conducted which examined mental practice in an athletic

setting was by Vandell, Davis, and Clugston (1943). They found that daily mental practice was as effective as daily physical practice in improving performance in dart throwing and in shooting basketball free throws. Clark (1960) conducted a comprehensive study utilizing male high school students in three groups: a) varsity basketball players, b) junior varsity basketball players, and c) novices. For the first two groups, the effect of mental practice was not significantly different than physical practice in terms of basketball free throw accuracy. For the novice group there was a greater improvement for actual practice, compared to mental practice. However, the percent improvement for mental practice for novices was greater than for either the varsity or junior varsity basketball players. Improvement of performance through use of imagery of mental rehearsal has been demonstrated in gymnasts (Decaria, 1977), high jumpers (Mahoney, 1979), ski racers (Suinn, 1972 and Gallwey & Kreigel, 1977), golfers (Nideffer, 1981), spring board divers (Griswold, Note 2) as well as scuba diving (Griffiths et al., Note 1).

In order to obtain the best results from mental practice, actual physical experience with the skill is necessary. Corbin (1967) reported in a study using juggling as a complex motor skill, that mental rehearsal did not benefit subjects who had no previous experience on the task. Relaxation prior to mental practice has also been used to facilitate the effects of mental practice on performance (Nideffer, 1976; Suinn, 1972). Borkovec and Sides (1978) found that relaxation prior to using desensitization techniques produced in the subjects greater imagery

vividness, as well as "greater autonomic reactivity to imagery (heart rate) than subjects whose desensitization training did not include relaxation" (Hale, 1981, p. 39).

The ability to concentrate has been also shown to aid in athletic performance (Kauss, 1980; Nideffer, 1981; and Tutko & Tosi, 1976). According to Harris (1982) "concentration is tuning out all the distractions from the single-minded involvement in the task" (p. 32). Nideffer (1981) gives anecdotal evidence of his work with a professional tennis player having trouble with service. By improving her ability to concentrate, subsequent performance was improved. In addition to directly aiding performance, the ability to concentrate has also been shown to facilitate mental practice (Clark, 1960).

Finally, goal setting can be used as a cognitive strategy to improve performance. There have been numerous studies which have demonstrated a positive relationship between performance and goal setting (Locke, 1968, 1966; Garland, 1982; Mossholder, 1980). The value of goal setting is "that goals are an immediate regulator of human action that influence performance by directing attention, mobilizing effort, increasing persistence, and motivating strategy development" (Garland, 1982, p. 245).

The proper use of coping skills and strategies is the individual's responsibility. Paul (1979) outlined three crucial factors necessary to ensure maximum effectivenss. "Regular practice is necessary for improvement; the method should be used with care and integrated with other measures, and should be administered live" (Collins, 1982, p. 19). Harris (1982) stated that the emphasis must be placed on the athlete to

assume responsibility for the self-regulation and control throughout training. Skills are introduced and then must be practiced in order that they can be applied in any situation where anxiety is generated and skilled performance is still required.

CHAPTER III

METHOD

This investigation was designed to determine whether the teaching of coping strategies to beginning scuba divers is an effective means of increasing performance and reducing anxiety during two open-water dives. In addition, the effects of teaching coping strategies on the performance of two pool tasks was evaluated. A subproblem of the study was to correlate anxiety levels, as measured by the State-Trait Anxiety Inventory (STAI) and scuba performance of both pool and open-water tasks. Finally, the effect of teaching coping strategies on the cognitive and somatic aspects of anxiety as measured by the Cognitive-Somatic Anxiety Questionnaire (CSAQ) was investigated.

Subjects

The subjects were 69 students (males = 51, females = 18) between the ages of 18-23 enrolled in the Basic Instructional Program scuba classes during the fall 1982 term at The Pennsylvania State University. There were four separate classes available during the fall term: Monday-Wednesday, 12th or 13th period as well as Tuesday-Thursday 12th or 13th period. Two of the classes were designated as the experimental group (Tuesday-Thursday, 12th and 13th periods) and two classes were designated as the attention placebo group (Monday-Wednesday, 12th and 13th periods). Inasmuch as students select convenient class times to fit into their academic schedule and the times for the course were identical on both days, it was assumed there was no particular bias or pattern to the course enrollment. An additional 30 subjects between the ages of 18-23

who were enrolled in the Basic Instructional Program intermediate swimming class during the fall 1982 term were used in order to compare trait anxiety scores only. Informed consent was obtained prior to participation (see Appendix A).

Self-Report Measures

The State-Trait Anxiety Inventory (STAI). This inventory is made up of two separate self-report scales, one of which measures state anxiety (A-state) and the other measures trait anxiety (A-trait). A-state is considered to be a transient emotion and is measured by asking the subject to rate his/her feelings at a particular time. The STAI A-state scale consists of 20 items which are answered in one of four ways (1 = not at all, 2 = somewhat, 3 = moderately so, 4 = very much so). (See Appendix A)

Trait anxiety is a relatively stable personality trait characterized by a predisposition to anxiety. A subject who scores high on the A-trait scale is more prone to perceiving situations as threatening than would a low A-trait subject. The A-trait scale, which also consists of 20 statements, is marked by the subject to indicate how he/she generally feels (1 = almost never, 2 = sometimes, 3 = moderately so, 4 = almost always). Norms for a population of male, undergraduate students were 37.68 with a standard deviation of 9.69 for A-trait and 36.35 $\pm$ 9.67 for A-state (Heyman et al., 1980). For students enrolled in beginning scuba classes resting norm means of 33.93 $\pm$ 7.83 and 30.62 $\pm$ 8.79 were found for A-trait and A-state, respectively (Heyman & Rose, 1980).

The Cognitive-Somatic Anxiety Questionnaire (CSAQ). This inventory is a 14-item anxiety inventory consisting of a 7-item cognitive anxiety scale and a 7-item somatic anxiety scale. Subjects rate the degree to which they generally feel each symptom in an anxiety producing situation on a 5-point scale. A 1 represents "not at all" and a 5 represents "very much so."

The two scales of the CSAQ have been correlated to the STAI trait inventory. The correlations were both significant (r = +.67--cognitive and r = +.40--somatic, $p < .001$) (Schwartz, Davidson, & Goleman, 1978), but weak (r^2 = .449 and .16).

Scuba Performance Measures

Respiration rate. Respiration rate was measured by counting a divers exhalations as evidenced by bubbles rising from the regulator to the surface for a period of 30 seconds. During the first open-water dive, respirations were counted from the surface. For the second open-water dive, respiration rate was counted by a submerged scuba diver. Respiration has been shown to be highly correlated to underwater performance, r = .74 (Griffiths et al., 1982). Griffiths et al. evaluated the performance of the subjects through the use of specially trained independent instructors unaware of the study.

Four-corner breathing task. This task is designed to test a student's ability to function underwater without constant airflow. Four scuba tanks, with regulator attached, were placed (one each) in the four corners of the diving well at McCoy Natatorium. The tanks were at 14 feet of depth and were 42 feet apart. Starting at one corner, the subject was required to surface dive to the first tank wearing a bathing

suit, weight belt, fins, and mask. Upon reaching the first tank the student was required to clear the regulator and take two breaths. The student then swam underwater to the next tank and repeated the procedure. This was repeated for tanks three and four. After leaving tank four, the subject removed his/her mask and repeated the circuit. After breathing from tank four the diver surfaced and put on a "black-out" mask, which totally obscured the vision. The subject was again required to swim to all four corners of the pool, breathing from each submerged scuba tank. The student's score was the total number of tanks breathed from (12 points maximum).

Combination test. This test required that the subject swim a number of 25-yard lengths of the swimming pool in a variety of conditions for a timed score. Initally, two subjects entered the pool with full scuba gear and swam four lengths while sharing one regulator, using the principle of "buddy-breathing." Next, the subject was required to swim four lengths with full gear utilizing the snorkle as the only source of air. Upon completion of the fourth lap, the subject was required to swim four lengths underwater utilizing scuba equipment. Then the subject doffed all scuba and diving equipment and swam two lengths. Upon completion of the second length the diver was required to secure all equipment and using the regulator as a source of air swim two lengths while moving the equipment along the bottom of the pool. Finally, the subject was required to don all equipment and swim two lengths utilizing the scuba equipment. Subjects have this test described in detail prior to commencing.

Procedure

Students enrolled in the fall term Basic Instruction Program scuba classes were subjects for this study. There were four classes, which were held either Monday-Wednesday or Tuesday-Thursday for ten weeks. The two early classes (12th period) were from 8:00 to 10:10 a.m., and the two late classes (13th period) from 10:15 a.m. to 12:25 p.m. Students taking the scuba training on the Monday-Wednesday schedule were designated as the attention placebo group. Students taking the course on the Tuesday-Thursday schedule were selected to receive the experimental treatment (see Appendix B). All subjects signed the informed consent form during the second attendance. In addition, all subjects were administered the STAI A-trait and CSAQ during the second attendance. All subjects were told that the questionnaires were part of a study to assist in understanding more about performance in scuba diving. Two Basic Instruction Program intermediate swim classes were administered the STAI A-trait and CSAQ during their third class attendance.

Subjects were evaluated on two in-pool scuba performance tasks: the four-corner station breathing task during the 17th lesson and the combination test during the 18th lesson. The STAI A-state scale was administered, at pool side, to the subjects immediately prior to their starting the tasks. Performance during the two open-water dives at Stone Valley Recreation Area was evaluated by determining respiration rates. During the familiarization open-water dive, on the 15th attendance, respiration rate was counted after the subjects had come to rest in a kneeling position in ten feet of water. On the second open-water dive (19th attendance) at Stone Valley Lake, respiration rate was

counted by a qualified scuba diver from the Nittany Diver Scuba Club, after subjects had come to a rest on a sunken platform at a depth of 18 feet. Subjects decended in pairs in order to be "checked out" by the instructor. The scuba diver in the water counted respirations for 30 seconds of either the subject waiting or just finishing the "check out." The A-state scale was administered to the subjects while they were preparing their equipment for each dive. The STAI A-trait scale and the CSAQ were readministered during the 20th class attendance.

Treatment

The experimental treatment consisted of 15 sessions lasting 20 minutes where the subjects were introduced to various coping strategies which have been used to improve athletic performance. Topics introduced to the subjects were goal setting, progressive relaxation training, imagery, concentration, and mental rehearsal. Subjects were told to practice skills learned in class at home and to relate them to their scuba training. All techniques taught utilized scuba specific cues and situations. The treatment sessions were conducted by the experimenter and were conducted during the second through 16th class attendances. See Appendix B for details.

The placebo control group received two 20-minute presentations on the activities of the Nittany Divers Scuba Club, including the type and number of dive trips which the club organizes. In addition, two 20-minute films were shown depicting various scuba related activities.

Treatment of the Data

The A-state scores of the divers having the lowest respirations rates were compared to the A-state scores of the divers having the highest respiration rates using the Behrens-Fisher *t'* test. Performance scores between groups were also analyzed by use of the Behrens-Fisher *t'* test. Changes in state anxiety were analyzed by a 2 x 4 (group by performance test) ANOVR. Differences in the CSAQ and A-trait scores were analyzed by three one-way ANOVA's, each with three groups (experimental, control, and intermediate swimmers). Pre- and post-scores of the CSAQ and A-trait scale for the experimental and control groups were analyzed with a Behrens-Fisher *t'* test.

CHAPTER IV

ANALYSIS OF DATA

This study investigated the effects of teaching coping strategies on the performance and anxiety of beginning scuba divers. Performance was evaluated during two open-water dives as well as during two pool tests. In addition, state anxiety levels were correlated with scuba performance of both pool and open-water tasks. Finally, the effect of teaching coping strategies on cognitive and somatic aspects of anxiety, as measured by the CSAQ, was evaluated.

Data were collected using 69 subjects enrolled in the Basic Instruction Program scuba classes during the fall 1982 term at The Pennsylvania State University. An experimental and attention placebo group were designated according to which days the class was held. Due to attrition the final group sizes were n = 31, for the experimental group and n = 26 for the attention placebo group. In addition, a group (n = 30) of intermediate swimmers was recruited in order to obtain A-trait and CSAQ scores on a similar sample of swimmers. The experimental group received 15 sessions, lasting 20 minutes of various coping strategies (goal setting, progressive relaxation, imagery, concentration, and mental rehearsal).

Relationships of State Anxiety Between Good and Poor Performers During the Open-Water Dives

There were no significant differences between the mean A-state scores of good performing divers and poor performing divers during either of the two open-water dives. Group means were analyzed using the

Behrens-Fisher t' test. Although the A-state scores increased from the first dive to the second dive, the comparison of scores produced the same insignificant results, Dive 1 t' (26) = .245 and Dive 2 t' (24) = .419, $p > .05$. The results are in Table 1.

Table 1

Means and standard deviations of A-state scores during two open-water dives

Dive		Performance Rating	
		Good	Poor
First	M	27.86 (n = 14)	28.38 (n = 16)
	SD	6.19	5.25
Second	M	34.56 (n = 13)	38.08 (n = 18)
	SD	6.17	7.45

Respiration rates were established in order to use the approximate top and bottom quartiles of all divers for analysis. For the first dive, good performance was 12 or less breaths per minute, while poor performance was defined as 20 or more breaths per minute. For the second dive the cut offs were 12 and 18 breaths per minute, respectively. Hypothesis 1 was not supported.

Pool Test Performance

As hypothesized, there was no significant difference between the experimental group and the attention placebo group in terms of performance in either pool task. The Behrens-Fisher t' test did not reveal a significant difference for either the four-corner test (t' (47) = .77, $p > .05$)

or the combination test (t' (38) = -.96, $p > .05$). The results are presented in Table 2.

Table 2

Means and standard deviations of pool performance tests

Group		Performance Test	
		Four-Corner[a]	Combination Test[b]
Experimental	M	11.26	14.35
	SD	1	1.37
Attention Placebo	M	10.93	15.05
	SD	2	2.13

[a]Score reflects total number of tanks breathed from during test.
[b]Score is in minutes and seconds.

The distribution of scores for the four corner test revealed a ceiling effect near the maximum of 12. This fact, combined with a small standard deviation, indicated the four-corner test was not a good discriminator of performance. The distribution of scores for the combination test were approximately normal.

Open-Water Performance

The Behrens-Fisher t' test revealed a significant difference, t' (53) = -4.83, $p < .0001$, between the performance of the experimental group and the attention placebo group for the first open-water dive. However, there was not a significant difference, t' (51) = -1.15, $p > .05$, in the performance levels for the second open-water dive. The results are displayed in Table 3.

Table 3

Means and standard deviations of respiration rates during two open-water dives

Group		Open-Water Dive[a]	
		First	Second
Experimental	M	14.5	14.3
	SD	4.0	3.32
Attention Placebo	M	19.5	15.25
	SD	4.47	2.12

[a]Score reflects number of breaths per minute.

Hypothesis 3, which stated the experimental group would perform better than the attention placebo, was only partially supported. The experimental group had significantly lower respiration rate than did the attention placebo group for the first dive. This difference did not exist for the second dive, in fact the respiration rates for the groups were very similar. The interaction effect between groups and open-water dive was tested using a t test for independent groups. The attention placebo group showed a significantly greater decrease in respiration rate from the first dive to the second dive (t = -.3.19, $p < .05$), see Figure 1. It is reasonable to infer that the first dive had a facilitative effect on the performance of the second open-water dive for the attention placebo group. The respiration rates for both groups were distributed normally.

State Anxiety

The state anxiety scores, which were obtained immediately prior to each performance measure, were examined by use of a 2 x 4 (Group x Performance Test) ANOVR. The ANOVR revealed significant effects between groups, F (1,55) = 13.355, $p < .001$; within groups, F (3,142) = 55.75, $p < .0001$; and the interaction of Groups x Performance Test, F (3,142) = 6.572, $p < .0001$. The Mauchly Sphericity test of the population variances was significant, indicating that the assumptions of analysis of variance concerning homogeneous variances had been violated. The adjusted probabilities resulting from the Box-Geisser-Greenhouse Index were used in order to reduce the possibility of making a Type I error as a result of this homogeneity violation. The ANOVR summary table for this analysis is found in Appendix C. The means and standard deviations of the A-state scores are presented in Table 4.

Table 4

Means and standard deviations of group A-state scores

Group		Performance Measure			
		Dive 1	Four-Corner	Combination Test	Dive 2
Experimental	M	30.93	46.55	44.65	35.58
	SD	6.32	12.28	10.30	7.965
Attention Placebo	M	27.27	38.27	33.35	33.04
	SD	4.63	8.17	7.43	6.90

The A-state means and standard deviations are graphically depicted in Figure 2 and Figure 3, respectively.

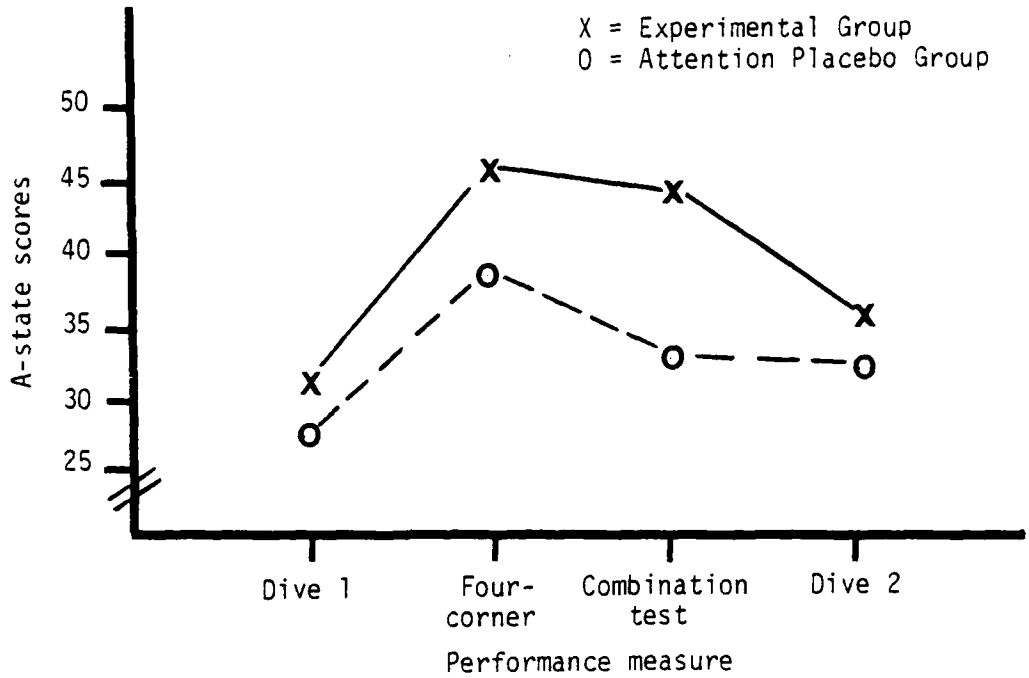

Figure 2: Mean A-state scores across performance tasks

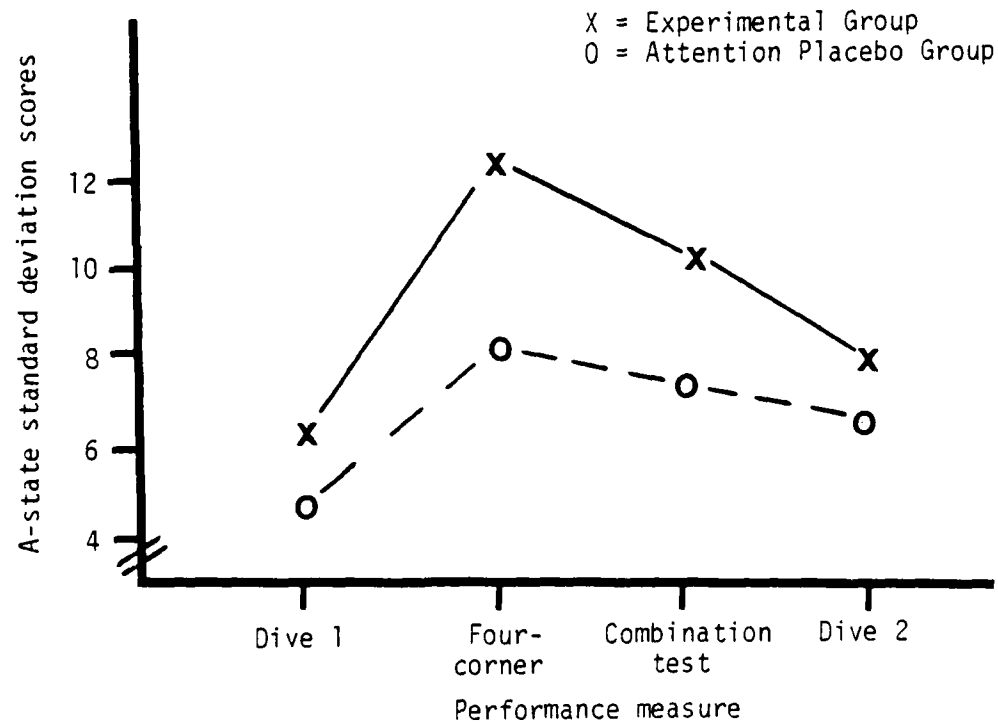

Figure 3: A-state standard deviation scores across performance tasks

The significance between groups interaction was further examined by use of a post hoc Behren-Fisher test to counter the effect of heterogeneous variance. The results are depicted in Table 5.

Table 5

Post hoc comparison of A-states between groups

	Performance Measure			
	Dive 1	Four-Corner	Combination Test	Dive 2
t'	2.6*	2.96*	5.09*	1.290

*Significant, $p < .05$.

Although these results are significant, they are the opposite of what had been hypothesized. The attention placebo group had significantly lower A-state scores for three of the four performance measures.

Within group post hoc comparisons were made utilizing Tukey's WSD. The results are displayed graphically utilizing Duncan's underlining method in Table 6.

Hypothesis 4, which stated that the state anxiety levels for beginning scuba divers would be higher prior to the open-water dives than in pool environment, was not supported. For the experimental group the A-state scores were significantly higher for the two pool tests compared to the open-water dives. The attention placebo group also had pool A-state scores which were higher than the open-water scores. The four-corner A-state score was significantly higher than the scores for

Table 6

Post Hoc comparisons of A-states within groups

Group	Task			
	(1) Dive 1	(4) Dive 2	(3) Combination Test	(2) Four-Corner
Experimental	30.93	35.58	44.65	46.55
Attention Placebo	27.27	33.04	33.35	38.27

the two open-water dives. The combination test was significantly higher than the A-state score for the first dive.

A χ^2 test was run to test the assumption of homogeneous variances and homogeneous correlations between repeated measures of the two independent groups. The results of this test, χ^2 (8) = 34.784, $p < .0001$, is an omnibus test justifying analysis of the individual variance-covariance matrices. Separate χ^2 tests were conducted in order to analyze the variances and correlations of state anxiety within each group. The test for the attention placebo group was not significant; however, the χ^2 for the experimental group, χ^2 (8) = 22.172, $p < .005$, was significant indicating that the treatment had a significant effect on the variance-covariance matrix of the state anxiety scores. These relationships were further analyzed utilizing a t test for dependent samples. The results of these tests are displayed in Table 7, utilizing Duncan's underlining notation. The variance-covariance matrices are in Appendix D.

Table 7

Comparison of A-state variances for the experimental group

		Performance Measure			
		(1) Dive 1	(4) Dive 2	(3) Combination Test	(2) Four-Corner
A-state	s^2	39.99	63.45	106.1	150.72

These results indicate that the experimental treatment had different effects on different subjects. The ramifications of such results will be discussed later.

Cognitive and Somatic Anxiety

The experimental treatment group did not show a significant (t (28) = -1.47, .53, respectively) decrease in either the cognitive or somatic subscale scores of the CSAQ. However, the attention placebo group had significant, t (23) = -.2.80, -2.445, respectively, increases in both the cognitive and somatic components of anxiety as measured by the CSAQ. The pre- and post-treatment scores were analyzed by a t test for dependent samples. The means and standard deviations of the CSAQ are presented in Table 8.

Table 8

Means and standard deviations of CSAQ scores

Group		Cognitive Score		Somatic Score	
		Pre	Post	Pre	Post
Experimental	M	15.03	17.03	20.22	19.10
	SD	7.75	9.89	7.85	8.63
Attention Placebo	M	10.59	14.72	15.11	17.60
	SD	7.79	8.85	8.6	8.53

Although Hypothesis 5 was not directly supported by significant results, the fact that the attention placebo group scores increased significantly on both subscales indicated there may have been a treatment

effect which kept cognitive and somatic anxiety levels around the original levels.

Noting that the original pretreatment scores were seemingly different, the CSAQ scores and A-trait scores were analyzed by three 3 x 1 (Group x Anxiety Score) ANOVAs. In addition to the two groups involved in the study, a third group of intermediate swimmers was included for comparison reasons. All three ANOVA's showed significant between group differences (see Appendix C). The means and standard deviations for the three groups are in Table 9. These differences were

Table 9

Pretreatment means and standard deviations for A-trait and CSAQ scores

Group		A-trait	Cognitive	Somatic
Experimental	M	33.29	15.03	20.23
	SD	7.13	7.52	7.85
Attention Placebo	M	30.52	10.59	15.11
	SD	7.79	8.69	5.42
Intermediate Swimmers	M	37.17	22.9	21.47
	SD	7.23	12.20	9.08

further examined by use of post hoc LSD test. For the cognitive subscale of the CSAQ the intermediate swimmers had significantly higher scores than either of the two scuba groups. This finding was the same for the A-trait scores indicating that the subjects for the study had lower A-trait scores. However, the attention placebo group had significantly lower scores than either the experimental group or the intermediate

swimmers on the somatic subscale of the CSAQ. While this difference existed for the pretreatment scores, there was not a significant difference between the post test scores (t (53) = .64, p = .563) for the experimental and attention placebo group.

Course Completion Rate

Due to confounding circumstances scuba course completion rate was not analyzed. Each class was initially assigned 18 students in order to control class size. After being assigned to a scuba class, each student must pass a physical and a swim test. As a result of these or other factors, seven students in the attention placebo group dropped out in the first week. There were five subjects who dropped scuba class in the first week in the experimental treatment group. Of the students who continued past the first week in the experimental group (n = 31), all completed the course and were certified. The attention placebo group had three subjects who failed to become certified divers despite the fact they attended all classes. Their data were not included in the analysis since they did not complete the final testing. The initial drop-out rate and number of divers not receiving certification was considered normal by the diving instructors. Hypothesis 6 is supported in that the experimental treatment group had a higher certification rate than the attention placebo group, but this is not considered to be statistically significant.

CHAPTER V

SUMMARY, DISCUSSION, AND CONCLUSIONS

This study intended to determine the effect of teaching coping strategies (goal setting, progressive relaxation, concentration, imagery, and mental rehearsal) on the performance of beginning scuba divers during two open-water dives. In addition, the effect of the treatment on the performance on two pool tasks was examined. The relationship of state anxiety and performance was also assessed. Finally, the effect of teaching coping strategies on the cognitive and somatic aspects of anxiety, as measured by the CSAQ, was evaluated.

This chapter provides a summary of the investigation and is presented as follows: a) summary of procedures, b) summary of findings, c) conclusions, d) discussion, and e) recommendation for further study.

Summary of Procedures

The subjects for this study were students enrolled in the Basic Instruction Program scuba classes for the fall 1982 term. An experimental and an attention placebo group were established based on the days of class attendance (Attention Placebo--Monday/Wednesday, and Experimental--Tuesday/Thursday). All subjects filled out STAI A-trait and CSAQ questionnaires during their second class attendance. The experimental treatment consisted of 15 sessions (20 minutes per session) which stressed various coping strategies and their uses. The subjects covered included goal setting, relaxation, concentration, imagery, and mental rehearsal. The attention placebo group was shown two scuba related movies and received two talks on the function and activities of

the Nittany Dive Club. Four performance measures were evaluated: two pool tasks (four-corner station breathing and a combination test) and two open-water dives (conducted at Stone Valley Recreation Area). Immediately, prior to each performance test, the subjects were administered the STAI A-state inventory. At the last class meeting all subjects were readministered the STAI A-trait and the CSAQ.

Comparisons between groups were analyzed utilizing the Behrens-Fisher t' test. The analysis of variance with repeated measures was used to examine the state anxiety scores. Additional data were analyzed utilizing ANOVA and correlation techniques.

Summary of Findings

The A-state scores of the divers having the lowest respiration rates on the two open-water dives and those subjects having the highest respiration rates were not significantly different.

The experimental group had a significantly lower respiration rate for the first open-water dive than the attention placebo group ($\bar{X}$ = 14.5, $\bar{X}$ = 19.5). However, for the second open-water dive there was virtually no difference between the two groups in terms of respiration rate. The respiration rate of the experimental group dropped only slightly during the second dive; whereas, the attention placebo group demonstrated a significant decrease in respiration rate. As expected, the performance levels for the two pool measures, the four-corner station breathing task and combination test, were not significantly different for the two groups. The results of the four-corner test indicate that it was not a good discriminator of performance.

There was, however, a significant interaction of A-state scores between groups and across performance measures. Post hoc between group comparisons revealed a significant difference for three of the four performance measures. This difference was opposite of what had been hypothesized. The attention placebo group was significantly less anxious for the first open-water dive, the four-corner test, and the combination test. Only for the second open-water dive was there no significant difference, although the scores indicated less anxiety for the attention placebo group. Within group comparisons showed that there were significant differences in A-state levels for both groups. For the experimental group the subjects were significantly more anxious during the pool tests than they were for the open-water dives. There was also a significant increase in anxiety from the first to the second open-water dive. The attention placebo group demonstrated similar results. The A-state score for the four-corner test was significantly higher than either open-water dive anxiety score. There was also a significant increase in anxiety from the first open-water dive to the second. In addition, there was a significant difference in the variability of the A-state scores for the experimental group. In general, for both groups, means and variances tended to increase (and decrease) together across the four tests.

The CSAQ cognitive and somatic anxiety subscale scores for the attention placebo group increased significantly from the pretest to the posttest. There was not a significant difference in the pre- to post-scores for the experimental group on either subscale of the CSAQ. On the pretest the attention placebo group scored significantly lower on

the somatic subscale but on the posttest there were no significant differences for any of the trait anxiety scores between the groups.

Conclusions

Based on the preceding findings, the following conclusions can be made:

1. Divers who perform well on open-water dives, as measured by respiration rate, are not less anxious than those who perform poorly.

2. The experimental treatment group and the attention placebo group performed equally as well in performance tests conducted in the pool.

3. The experimental treatment group performed better than the attention placebo group on the first open-water dive. This did not hold for the second open-water dive.

4. The state anxiety scores were lower for the open-water dives when compared to the pool dive. This held true for both groups. This was opposite to expectations.

5. The experimental treatment group does not show a decrease in either the cognitive or somatic manifestations of anxiety when comparing pre-treatment and post-treatment scores.

6. Due to confounding circumstances, the completion rate for both groups cannot be compared.

Discussion

In general, this investigation failed to find a significant relationship between the teaching of coping strategies and the performance of beginning scuba divers. No differences were expected for the

pool performance tests since other studies have found that tests conducted in pools did not sufficiently raise anxiety (Griffiths et al., 1979, 1981). This study found no difference between the two groups' pool performance; however, anxiety rates were significantly higher for the experimental group for the combination test and the four-corner breathing task than for the attention placebo group. There was a significant difference between the two groups' respiration rate on the first dive at Stone Valley Recreation Area. This could be attributed to the emphasis placed on long, slow, deep exhalations during the introduction to progressive relaxation. The experimental group may have been able to focus attention on their breathing rather than on their task. There was no difference between the groups during the second dive, due to a significant decrease in the breathing rate of the attention placebo group. This decrease may have resulted from the familiarization with the task provided by the initial open-water dive.

The environmental conditions were decidedly different for the two days. The first dive for both groups was conducted on a day which was sunny and with temperatures in the low 70's (^{O}F). The water temperature was 51^{O}F. The second-dive day was cloudy, with light drizzle and temperatures in the low 40's (^{O}F). The water temperature was 49^{O}F. Dives were conducted such that the 12th period class was able to wear "dry" wet suits while the 13th period class had to wear "damp" wet suits. (A comparison of respiration rates between 12th and 13th period classes did not reveal a significant difference.) Due to the many factors which can affect a diver's respiration rate (depth, water temperature, wet suit fit, and physical conditioning), these reported

respiration rates are only relevant to this study; however, these conditions were controlled for, as much as possible. The respiration rates are only good for comparisons and are, by themselves, not meaningful. The respiration rates reported in this study are similar to those reported by Griffiths et al. (1981).

The significant decrease in respiration from the first to the second dive for the placebo group indicates that the first dive facilitated performance during the second dive. Although there was also an increase in A-state scores, this increase could reflect an increase in arousal or preparedness necessary to improve performance (Harris, 1982; Kauss, 1980). The performance accomplishments during the first dive could have increased the self-efficacy of the subjects. The experience of the first dive enabled the divers to know what to expect during the second dive. This may have allowed them to pay more attention to their breathing. Prior to the first dive, none of the subjects had ever been scuba diving in Stone Valley Recreation Area. They may have been unsure of the experience, the use of the scuba equipment in a low visibility environment, the protection offered by a wet suit, or the marine life they might encounter. The experimental group had practiced with a relaxation response which focused on long, deep, slow exhalations, which is the preferred way of breathing when using scuba apparatus (Mount & Ikehora, 1979). This could explain the initial difference between the two groups. But the experimence of the first dive enabled both groups of divers to know exactly what to expect for the second dive. This knowledge could be reflected in the lower respiration rate of the attention placebo group.

Scuba certification requires two open-water dives. The first dive is normally conducted under greater constraints, such as depth and time limits. The purpose of this dive is familiarization of the diver with the under water environment and scuba equipment. During the second dive the students are free to go wherever they choose within the limits of their air supply and the requirement of having a partner or diving buddy. The use of coping strategies provided an initial advantage to the experimental group. This is an advantage because a lower respiration rate will allow a diver to remain under water longer. This, in turn, could lead to further enjoyment of scuba diving and lead to increased participation (Heyman & Rose, 1980).

When assessing the performance of divers during the open-water dives, there was no difference in A-state scores of those divers categorized as "poor" when compared to those whose performance was "good." The correlations between performance during the two dives and the respective A-state scores failed to reach significance (first dive $\underline{r}$ = 0.0632, $\underline{p}$ = .320; second dive $\underline{r}$ = .1824, $\underline{p}$ = .091). The lowest A-state scores were recorded for the first dive. This may indicate that the divers did not have enough relevant information regarding what to expect during the first open-water dive. The A-state scores increased for both groups on the second dive; however, the scores were still below the norms for male college-aged subjects. The difference in respiration rates would have to be explained by factors other than state anxiety. The "poorer" divers may have been "ready" for the task, that is, physiologically aroused as evidenced by the increased respiration rates. However, they did not perceive themselves as being anxious as reflected in their A-state scores.

The effectiveness of the experimental treatment in reducing state anxiety was not demonstrated. This finding is the opposite of what other studies have found (Decoria, 1977; Griffiths, Note 1). In fact, the teaching of coping strategies significantly increased the anxiety levels of the group which received such instruction. The experimental group had significantly higher A-state scores for the first dive, the four-corner test, and the combination test. The difference in the A-state scores of the first dive can be attributed to the treatment. The attention placebo group were just told they would make a familiarization dive at Stone Valley Lake. The experimental group received the same information; however, during the experimental treatment sessions, they were told to visualize diving in Stone Valley. While maintaining a relaxed position they were instructed to "feel" the initial chill of the water, imagine the brown, murky water, and to imagine the feeling of swimming through the water. This training session probably heightened their arousal and served to make them more aware of what to expect.

This explanation also holds true for the four-corner breathing task and the combination test. These tests have been developed by the scuba instructors at The Pennsylvania State University in order to place students in a stressful pool training environment. This allows the instructors to observe the students and to evaluate them as divers. The tests are based on standard scuba skills. The attention placebo group's classes were told nothing about the tests, only that they would be evaluated on a test on a specific day. The tests were not fully explained until just prior to taking the test (the normal procedure). The experimental group had the tests explained to them in detail, one

class prior to taking the test. After the explanation, the students were led through a relaxation period followed by mental rehearsal of the tests. The students were also encouraged to use mental practice of the tests on their own time, prior to being tested. As previously mentioned there were no performance differences between the groups. Actual physical practice was not conducted because of the nature of the pool tasks and due to time constraints. The instructors have found that allowing the students to practice these tests reduces their value as a training vehicle and does not give an accurate picture of a student's ability to react to a stressful situation. Mental practice without actual physical experience has been shown not to facilitate performance (Corbin, 1967; Richardson, 1967). What the treatment did do was significantly raise the A-state levels for three of the four performance tests by increasing their awareness of what they had to do. The scores for the combination test and the four-corner task were significantly higher than A-state norms, and higher than scores reported for any other scuba task (Griffiths et al., 1979, 1982; Heyman and Rose, 1980). One subject reported that she had to stop her mental rehearsal at home because she had become too anxious. The attention placebo group also had higher state anxiety scores for the combination test and the four-corner breathing task when compared to the group scores for the open-water dives. The four corner test score was significantly higher than all other scores, while the combination test A-state score was significantly higher than the first dive A-state results.

The relative order of the four A-state scores was the same for both groups. From lowest to highest: Dive 1, Dive 2, combination test,

and the four-corner task. Both groups demonstrated a significant difference on state anxiety scores from the first to the second dive. An increased knowledge of what to expect during the dive could have increased their arousal levels, in order that they would be better prepared for the experiences. In addition, during the second dive they were checked out on certain scuba skills which the diver must pass in order to become certified. The fact that they were being formally evaluated may have increased anxiety levels as well.

Both groups showed a significant rise in state anxiety for the four-corner test. The significantly higher experimental score may be due to the treatment. They were explained the task and were able to use mental rehearsal but without physical practice. This may have increased their awareness and their anxiety levels. The nature of the task is such that it is perceived to be much more difficult than it really is. The instructors have found that once the task is attempted and even partially completed, any anxiety or nervousness on behalf of the student is dissipated. A retest of this task often leads to a maximum score of 12. Because of this fact, the four-corner breathing task is really a training device and not a reliable test measure. It has been developed to make the student confront a situation which is perceived to be difficult and yet can be handled easily if the student has confidence in his/her own ability. The combination test showed a different pattern of results. The A-state scores of the attention placebo group dropped significantly, while the experimental group scores remained elevated. This could again be due to the fact that the task was disclosed early to the experimental group without an opportunity to combine mental rehearsal with actual

practice. Another contributing factor to the fluctuations in anxiety levels were the evaluations inherent in both tests. In order to become a certified diver, there were specific standards which must be met on both tests.

The experimental group also had significant variance differences. These differences, which seem to be attributable to the treatment, did not occur between any two adjacent groups when ranked in terms of magnitude of variance (see Table 7). The rank order for the variances was the same as for the means. The largest variance (four-corner test), was significantly larger than variances obtained for either open-water dive. This relfects that the treatment had different effects on different individuals. Indeed, some of the individual scores for the four-corner test were in the mid 60's and low 70's. The attention placebo group had only two scores over 55, but neither of these subjects was included in the data analysis. They were not allowed to continue the course due to poor performance. Eliminating the poor performers from the attention placebo group lowered their mean score. In contrast to the high scores in the experimental group, there were a number of scores in the high 20's and low 30's. This indicates that not all scores were inflated by the treatment. There were five subjects in the experimental group who had consistantly low A-state scores. After completion of the study, they were asked if they had answered the questionnaire reflecting how they actually felt, or if they had answered how they felt they were expected to answer. All five indicated that they had accurately answered the questions. In addition, two of

the subjects were roommates and had practiced the coping strategies together during their free time.

Despite the fact that the experimental treatment group demonstrated higher anxiety levels than the attention placebo group, none of them was forced to drop the course due to poor performance. A total of three subjects were eliminated from the attention placebo group. Despite the higher anxiety levels, there were not differences in performance. This indicates that the experimental group was able to control their anxiety. This was one of the purposes in teaching coping strategies. Proper use of coping strategies is important for them to be effective (Paul, 1979). Within the structure of this scuba course, mental rehearsal of the specific tasks to be performed may not have been beneficial because physical practice was not feasible. Mental rehearsal of skills which are taught in the pool would probably be effective, but difficult to evaluate.

In terms of trait anxiety, scuba students have been found to score lower than published norms (Griffiths et al., 1978, 1979; Heyman and Rose, 1980). Both groups in this study were significantly less anxious than the norms. A group of intermediate swimmers was utilized as a comparison group. It was found that the intermediate swimmers were equivalent to the norm group ($\bar{X}$ = 37.1, norm = 37.68) (Spielberger et al., 1970) and as a group was significantly more anxious than either the experimental or attention placebo groups. Only those who are less anxious may elect to enroll in scuba classes.

The experimental group and attention placebo group were equivalent in terms of the CSAQ cognitive subscale. Both groups scored significantly

lower than the intermediate swimmers. However, in the somatic subscale the attention placebo group scored significantly lower than the experimental group and the intermediate swimmers. Comparison of the two scuba groups at the end of the course showed no difference between them. The hypothesis that the CSAQ scores of the experimental group would decrease when comparing pre- and post-treatment scores was not directly supported. The mean cognitive and somatic scores of the attention placebo group increased by 4.13 and 2.49, respectively. The experimental group had only an increase of 2 in the cognitive scale and a 1.13 point decrease in the somatic scale. Doyle (1981) attempted to predict the effects of various relaxation techniques on shooters self-reports of anxiety including the CSAQ. She had divided the shooters into cognitive and somatic reactors as determined by scores on the CSAQ. It was generally found that prediction of posttest anxiety was not accurate. Scuba diving, with its focus on the physiological functioning of the body as well as the mental side of diving, could enhance a diver's awareness of the cognitive and somatic aspects of anxiety. Courses are designed to teach students how to handle many of the situations they might encounter, such as, loss of air, losing track of one's partner, or having one's mask fill with water (Mount & Ikehara, 1979). The nature of the course makes a diver aware of the situations that diving can place him/her in underwater. This could explain the increase in scores on the cognitive and somatic subscales for the attention placebo group. The coping strategy may have offered a means to the experimental group divers to control their somatic anxiety, as well as slow the increase of their cognitive component.

Recommendations for Further Study

1. Repeat the above study with an additional group to serve as a control. The attention placebo treatment of showing two movies of scuba divers in the Gulf of Mexico, off the coast of Bermuda, or wreck diving off the coast of Novia Scotia could have influenced the anxiety levels of this group. In addition the presentations on the Nittany Dive Club stressed the pleasurable activities available to scuba divers. A control group might gain insight into the effects of anxiety on performance as a result of this attention placebo treatment.

2. A better performance test than the four-corner breathing task should be used. There was a ceiling effect in the scores which did not allow for an adequate range of scores. A new test could be devised or time, as a factor, could be used to help differentiate between scores.

3. Groups should not be told of the exact nature of the test prior to the actual testing (or they all should be informed). In this manner anxiety scores could be more equally compared.

4. Respiration rates should be counted for one minute in order to get a better distribution of scores.

5. Restrict the study so that only one instructor teaches all groups in the study. This would help control for any unknown effects caused by the different instructors. In order to have n's of greater than 25, the study would have to be extended over two semesters. The treatment, attention placebo, and control groups should be randomly selected.

6. A questionnaire could be developed to determine if scuba classes heighten the awareness of the subjects with regards to the cognitive and somatic aspects of anxiety.

REFERENCE NOTES

1. Griffiths, T. J., Steel, D. H., Vaccaro, P., Allen, R., and Karpman, M. The effects of an audio-cassette tape program entitled "Controlling diver stress and panic" on scuba diver stress and underwater performance. Paper presented at the National Underwater Activities Conference, Key West, Florida, June 1982.

2. Griswold, K. Imagery and competitive springboard diving. Paper presented at the National Conference of the North American Society for the Psychology of Sport and Physical Activity, College Park, Maryland, May 1982.

3. Seabourne, T. G., Weinberg, R. S., and Jackson, A. Effects of practice and training of visuo-motor behavior rehearsal in enhancing karate performance. Paper presented at the National Conference of the North American Society for the Psychology of Sport and Physical Activity, College Park, Maryland, May 1982.

4. Heyman, S. R. and Rose, K. G. Psychological and behavioral factors affecting the performance of beginning scuba divers. Paper presented at the National Underwater Activities Conference, Key West, Florida, June 1982.

REFERENCES

Barrett, E. S. Anxiety and implusiveness: Toward a neuropsychological model. In C. D. Spielberger (Ed.), Anxiety: Current trends in theory and research (Vol. 1). New York: Academic Press, 1972.

Basowitz, H., Persky, H., Korchin, S. J., & Grinker, R. R. Anxiety and stress. New York: McGraw-Hill, 1954.

Bernstein, D. A. and Borkovec, T. D. Progressive relaxation training. Champaign, Illinois: Research Press, 1973.

Borkovec, T. D. Physiological and cognitive processes in the regulation of anxiety. In G. E. Schwartz & D. Shapiro (Eds.), Consciousness and self-regulation (Vol. 1). New York: Plenum Press, 1976.

Borkovec, T. D. and Sides, J. K. Critical procedural variables related to the physiological effects of progressive relaxation: A review. Behavior Research and Therapy, 1978, 16, 119-125.

Cattell, R. B. The meaning and measurement of neuroticism and anxiety. New York: Ronald Press, 1961.

Clark, L. V. Effect of mental practice on the development of a certain motor skill. Research Quarterly, 1960, 31, 560-569.

Collins, J. D. Physiological correlates of coping skills and their development through training. Unpublished master's thesis, The Pennsylvania State University, 1982.

Corbin, C. The effects of mental practice on skill development after controlled practice. Research Quarterly, 1967, 38, 534-538.

Davidson, R. J. and Schwartz, G. E. The psychobiology of relaxation and related states: A multiprocess theory. In D. I. Mostofsky (Ed.), Behavior control and modification of physiological activity. Englewood Cliffs, New Jersey: Prentice-Hall, 1976.

Davison, G. C. Systematic desensitization as a counter-conditioning process. Journal of Abnormal Psychology, 1968, 73, 91-99.

Decaria, M. D. The effect of cognitive rehearsal training on performance and on self-report of anxiety in novice and intermediate female gymnasts. (Doctoral dissertation, University of Utah, 1977). Dissertation Abstracts International, 1977, 38, 1-B. (University Microfilms No. 77-14, 292)

Doyle, L. A. Differential effectiveness of relaxation procedures in alternating components of anxiety in shooters. Unpublished master's thesis, The Pennsylvania State University, 1981.

Egstrom, G. H. and Bachrach, A. J. Diver panic. Skin Diver, 1971, 20 (11), 36-37.

Epstein, S. and Fenz, W. D. Theory and experiment on the measurement of approach-avoidance conflict. Journal of Abnormal and Social Psychology, 1962, 64, 97-112.

Fenz, W. D. Conflict and stress as related to physiological activation and sensory, perceptual and cognitive functioning. Psychological Monographs, 1964, 78 (8), 1-33.

Fenz, W. D. Stress and its mastery: Predicting from laboratory to real life. Canadian Journal of Behavioral Sciences, 1973, 5 (4), 332-346.

Fenz, W. D. and Jones, G. B. Individual differences in physiological arousal and performance in sport parachutists. Psychosomatic Medicine, 1972, 34 (1), 1-8.

Fenz, W. D. and Jones, G. B. Cardiac conditioning in a reaction time task and heart rate control during real life stress. Journal of Psychosomatic Research, 1974, 18, 199-203.

French, S. N. EMG biofeedback for tension contrast during fine and gross motor skill acquisition. Unpublished doctoral dissertation, Oregon State University, 1977.

Gallwey, T. and Kreigel, B. Inner skiing. New York: Random House, 1977.

Garland, H. Goal levels and task performance: A compelling replication of some compelling results. The Journal of Applied Psychology, 1983, 36, 244-248.

Godsey, R. L. Efficacy of response contingent and program contingent progression in live and taped progressive relaxation training. Unpublished doctoral dissertation, Texas A & M University, 1979.

Griffiths, T. J., Steel, D. H., and Vaccaro, P. Anxiety levels of beginning scuba students. Perceptual and Motor Skills, 1978, 47, 312-314.

Griffiths, T. J., Steel, D. H., and Vaccaro, P. Relationship between anxiety and performance in scuba diving. Perceptual and Motor Skills, 1979, 48, 1007-1010.

Griffiths, T. J., Steel, D. H., and Vaccaro, P. Anxiety of divers: A multidimensional approach. Perceptual and Motor Skills, 1982, 55, 611-614.

Griffiths, T. J., Steel, D. H., Vaccaro, P., and Karpman, M. B. The effects of relaxation techniques on anxiety and underwater performance. International Journal of Sport Psychology, 1981, 12, 176-182.

Hale, B. D. The effects of internal and external imagery on muscular and ocular concomitants. Unpublished doctoral dissertation, The Pennsylvania State University, 1981.

Harris, D. V. Maximizing athletic potential: Integrating mind and body. Journal of Physical Education, Recreation, and Dance, 1982, 53, 31-33.

Heyman, S. R. and Rose, K. G. Psychological variables affecting SCUBA performance. In C. H. Nadeau, W. R. Halliwell, K. M. Newell, and G. C. Roberts (Eds.), Psychology of Motor Behavior and Sport 1979. Champaign, Illinois: Human Kinetics Press, 1980.

Hodgeson, R. and Rachman, R. II. Desynchrony in measures of fear. Behavior Research and Therapy, 1974, 12, 319-326.

Jacobson, E. Progressive relaxation. Chicago: University of Chicago Press, 1938.

Kauss, D. K. Peak performance. Englewood Cliffs, New Jersey: Prentice-Hall, 1980.

Lang, P. J., Lazorik, A. D., and Reynolds, D. J. Desensitization, suggestibility, and pseudotherapy. Journal of Abnormal Psychology, 1965, 70, 395-402.

Lehrer, P. M. How to relax and how not to relax: A re-evaluation of the work of Edmund Jacobson-I. Behavior Research and Therapy, 1982, 20, 417-428.

Locke, E. A. Toward a theory of task motivation and incentives. Organizational Behavior and Human Performance, 1968, 3, 157-159.

Mahoney, M. J. Cognitive skills and athletic performance. In P. C. Kendall and S. D. Hollon (Eds.), Cognitive behavioral interventions: Theory, research, and procedures. New York: Academic Press, 1979.

Mahoney, M. J. and Arnkoff, D. Cognitive and self-control therapies. In S. L. Garfield and A. E. Bergin (Eds.), Handbook of psychotherapy and behavior change. New York: John Wiley, 1978.

Martens, R. Anxiety and motor behavior: A review. Journal of Motor Behavior, 1971, 3 (2), 151-179.

Martens, R. Sport competition anxiety test. Champaign, Illinois: Human Kinetics Publishers, 1977.

Maupin, E. On motivation. In C. T. Tart (Ed.), Altered states of consciousness. New York: John Wiley, 1969.

Mossholder, K. W. Effects of externally mediated goal setting on intrinsic motivation: A laboratory experiment. Journal of Applied Psychology, 1980, 85, 202-210.

Mount, T. and Ikehara, A. J. The new practical diving. Coral Gables, Florida: University of Miami Press, 1979.

Nideffer, R. M. The inner athlete: Mind plus muscle for winning. New York: Crowell, 1976.

Nideffer, R. M. The ethics and practice of applied sport psychology. Ithaca, New York: Mouvement Publications, 1981.

Nideffer, R. M., Deckman, W. C. A case study of improved athletic performance following use of relaxation procedures. Perceptual and Motor Skills, 1970, 3, 821-822.

Paul, B. Relaxation training--the misunderstood and misused therapy. In F. J. McQuigan, W. E. Sime, and J. M. Wallace (Eds.), Stress and Tension Control. New York: Plenun Press, 1979.

Paul, G. L. and Trimble, P. W. Recorded versus "live" relaxation training and hypnotic suggestion: Comparative effectiveness for reducing physiological arousal and inhibiting stress response. Behavior Therapy, 1970, 1, 285-302.

Qualye, C. M. The relative effectiveness of audio-taped relaxation and live therapist presented relaxation in terms of physiological parameters. Unpublished doctoral dissertation, Utah State University, 1979.

Rachman, S. The role of muscular relaxation in desensitization therapy. Behaviour Research and Therapy, 1968, 6, 233.

Radloff, R. and Helmreich, R. Stress: Under the sea. Psychology Today, 1969, 40 (4), 321-328.

Richardson, A. Mental practice: A review and discussion: Part 1. Research Quarterly, 1967, 38, 95-107.

Ryman, D. H. and Biersner, R. J. Altitudes predictive of diving training success. Personnel Psychology, 1975, 28, 181-188.

Schwartz, G. E., Davidson, R. J., and Goleman, D. J. Patterning of cognitive somatic processes in the self-regulation of anxiety: Effects of meditation versus exercise. Psychosomatic Medicine, 1978, 40, 321-328.

Spielberger, C. D. Theory and research on anxiety. In C. D. Spielberger (Ed.), Anxiety and Behavior. New York: Academic Press, 1966.

Spielberger, C. D. Conceptual and methodological issues in anxiety research. In C. D. Spielberger (Ed.), Anxiety: Current trends in theory and research (Vol. 1). New York: Academic Press, 1972.

Spielberger, C. D., Gorsuch, R. L., and Luschene, R. E. Manual for the state-trait anxiety inventory. Palo Alto, California: Consulting Psychologists Press, 1970.

Suinn, R. M. Behavior rehearsal training for ski racers. Behavior Therapy, 1972, 3, 519.

Tooman, M. E. The effect of running and its deprivation on tension, mood, and anxiety. Unpublished master's thesis, The Pennsylvania State University, 1982.

Tutko, T. and Tosi, U. Sports psyching. Los Angeles: J. P. Tarcher, 1976.

Vandell, R. A., Davis, R. A., and Clugston, H. A. The function of mental practice in the acquisition of motor skills. Journal of General Psychology, 1943, 29, 243-250.

Wolpe, J. Psychotherapy by reciprocal inhibition. Stanford: Stanford University Press, 1958.

Wolpe, J. The practice of behavior therapy. New York: Pergaman, 1969.

APPENDIX A

TESTING INSTRUMENTS

1. INFORMED CONSENT FORM
2. SELF-EVALUATION QUESTIONNAIRE, STAI FORM X-1
3. SELF-EVALUATION QUESTIONNAIRE, STAI FORM X-2
4. COGNITIVE SOMATIC ANXIETY QUESTIONNAIRE

INFORMED CONSENT FORM

The Pennsylvania State University

Title of Investigation: The Effects of Teaching Coping Strategies on the Performance of Beginning Scuba Divers

Investigator: Louis G. Burgess

Date:

This is to certify that I, _____, hereby agree to participate as a volunteer in a scientific study as an authorized part of the education and research program of The Pennsylvania State University under the supervision of Dr. Dorothy V. Harris.

The investigation and my part in the investigation have been defined and fully explained to me by Louis G. Burgess, and I understand his explanation. A copy of the procedures of this investigation and a description of any risks and discomforts has been provided to me and has been discussed in detail with me.

I have been given an opportunity to ask whatever questions I may have had and all such questions and inquiries have been answered to my satisfaction.

I understand that I am free to deny any answers to specific items or questions in interviews or questionnaires.

I understand that any data or answers to questions will remain confidential with regard to my identity.

I understand that, in the event of physical injury resulting from this investigation, neither financial compensation nor free medical treatment is provided for such a physical injury, and that further information on this policy is available from the Vice President for Research and Graduate Studies, 207 Old Main (865-6331).

I certify that to the best of my knowledge and belief, I have no physical illness or weakness that would increase the risk to me of participation in this investigation.

I FURTHER UNDERSTAND THAT I AM FREE TO WITHDRAW MY CONSENT AND TERMINATE MY PARTICIPATION AT ANY TIME.

_____ _____

Date Subject's Signature

I, the undersigned, have defined and fully explained the investigation to the above subject.

Date _____ Investigator's Signature _____

I was present when the study was explained to the subjects in detail and to the best of my knowledge and belief it was understood.

Date _____ Witness _____

EXPLANATION OF STUDY

Purpose of Study

This study intends to investigate the effects of introducing subjects to various coping strategies as a treatment designed to enhance scuba performance. A large percentage of newly certified divers fail to continue diving after becoming certified. By improving underwater performance, enjoyment of the sport may be increased and the rate of divers who continue to participate might increase.

Procedures to be Followed

Subjects will participate in the regular scuba instruction as required by course instructors. In addition, all subjects will be required to participate in a treatment which will occur during regularly scheduled classes and will not extend the length of the period. During the course of instruction, subjects will be evaluated on two pool performance tasks and during two open-water situations. All tasks are part of the regular curriculum and will not require any extra time by students to perform. Prior to each performance, subjects will be required to fill out a short (20 item) personality inventory. In addition, two inventories will be administered during the third and the twentieth class attendances.

Discomforts and Risks

No additional risks or discomforts, apart from those inherent in scuba diving, are inherent in this study.

Period of Time Required

All procedures and treatments will take place in conjunction with normal class attendances and will not require any outside participation by subjects.

Volunteer's Signature	Date	Investigator's Signature	Date

In case of any additional questions or concerns which may arise during or after the study, feel free to contact the investigator:

Louis G. Burgess
1327 Old Boalsburg Road
State College, Pa. 16801
Home phone: 234-8795

SELF-EVALUATION QUESTIONNAIRE

STAI FORM X-1

NAME _____ DATE _____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you feel right now, that is, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

		Not At All	Somewhat	Moderately So	Very Much So
1.	I feel calm	1	2	3	4
2.	I feel secure	1	2	3	4
3.	I am tense	1	2	3	4
4.	I am regretful	1	2	3	4
5.	I feel at ease	1	2	3	4
6.	I feel upset	1	2	3	4
7.	I am presently worrying over possible misfortunes	1	2	3	4
8.	I feel rested	1	2	3	4
9.	I feel anxious	1	2	3	4
10.	I feel comfortable	1	2	3	4
11.	I feel self-confident	1	2	3	4
12.	I feel nervous	1	2	3	4
13.	I am jittery	1	2	3	4
14.	I feel "high strung"	1	2	3	4
15.	I am relaxed	1	2	3	4
16.	I feel content	1	2	3	4
17.	I am worried	1	2	3	4
18.	I feel over-excited and "rattled"	1	2	3	4
19.	I feel joyful	1	2	3	4
20.	I feel pleasant	1	2	3	4

SELF-EVALUATION QUESTIONNAIRE

STAI FORM X-2

NAME _____ DATE _____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you generally feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

		Almost Never	Sometimes	Often	Almost Always
21.	I feel pleasant	1	2	3	4
22.	I tire quickly	1	2	3	4
23.	I feel like crying	1	2	3	4
24.	I wish I could be as happy as others seem to be	1	2	3	4
25.	I am losing out on things because I can't make up my mind soon enough	1	2	3	4
26.	I feel rested	1	2	3	4
27.	I am "calm, cool, and collected"	1	2	3	4
28.	I feel that difficulties are piling up so that I cannot overcome them	1	2	3	4
29.	I worry too much over something that really doesn't matter	1	2	3	4
30.	I am happy	1	2	3	4
31.	I am inclined to take things hard	1	2	3	4
32.	I lack self-confidence	1	2	3	4
33.	I feel secure	1	2	3	4
34.	I try to avoid facing a crisis or difficulty	1	2	3	4
35.	I feel blue	1	2	3	4
36.	I am content	1	2	3	4
37.	Some unimportant thought runs through my mind and bothers me	1	2	3	4
38.	I take disappointments so keenly that I can't put them out of my mind	1	2	3	4
39.	I am a steady person	1	2	3	4
40.	I get in a state of tension or turmoil as I think over my recent concerns and interests	1	2	3	4

DATE _____ NAME _____

COGNITIVE-SOMATIC ANXIETY QUESTIONNAIRE

We would like you to rate the degree to which you generally or typically experience this symptom when you are feeling anxious, by circling one appropriate number from 0 to 9 on each item below.

1. My heart beats faster.

not at all very much so
0 1 2 3 4 5 6 7 8 9

2. I imagine terrifying scenes.

not at all very much so
0 1 2 3 4 5 6 7 8 9

3. I get diarrhea.

not at all very much so
0 1 2 3 4 5 6 7 8 9

4. I worry too much over something that doesn't really matter.

not at all very much so
0 1 2 3 4 5 6 7 8 9

5. I feel jittery in my body.

not at all very much so
0 1 2 3 4 5 6 7 8 9

6. I feel tense in my stomach.

not at all very much so
0 1 2 3 4 5 6 7 8 9

7. I find it difficult to study because of uncontrollable thoughts.

not at all very much so
0 1 2 3 4 5 6 7 8 9

8. I can't keep anxiety-provoking pictures out of my mind.

not at all very much so
0 1 2 3 4 5 6 7 8 9

9. Some unimportant thought runs through my mind and bothers me.

not at all very much so
0 1 2 3 4 5 6 7 8 9

10. I perspire.

not at all very much so
0 1 2 3 4 5 6 7 8 9

11. I can't keep anxiety-provoking thoughts out of my mind.

not at all very much so
0 1 2 3 4 5 6 7 8 9

12. I become immobilized.

not at all								very much so
0	1	2	3	4	5	6	7	8 9

13. I nervously pace.

not at all								very much so
0	1	2	3	4	5	6	7	8 9

14. I feel like I am losing out on things because I can't make up my mind soon enough.

not at all								very much so
0	1	2	3	4	5	6	7	8 9

APPENDIX B

TREATMENT

The experimental treatment for this study was designed to introduce beginning scuba divers to various coping strategies (goal setting, progressive relaxation, concentration, imagery, and mental practice) which subjects could use in order to improve their performance. In addition, it was designed to help subjects control their anxiety. There were 15 sessions of 20 minutes in duration. The sessions were held consecutively from the second through the 16th class attendances. All sessions were held in the classroom of McCoy Natatorium at The Pennsylvania State University. Subjects reported to the classroom at the designated time (8:00 a.m. or 10:25 a.m.) for 40-50 minutes of classroom instruction by the instructor. Upon completion of the classroom instruction, the class was turned over to the investigator for a 20-minute session. Upon completion of each session, the subjects would report to the pool for skills training by the instructor. All treatment sessions were conducted by the investigator.

This appendix specifies the subjects that were taught as well as providing the progressive relaxation and imagery scripts which were utilized.

Lesson 1

This session served as an introduction to all the treatment sessions. The topics covered were:

Definition of coping strategies
Uses of coping strategies
The mental aspects of athletic performance
Arousal and performance
Anxiety
Goal setting

Goal setting was covered in detail. All subjects were required to list their reasons and goals for taking scuba. They also were told to establish a time table for the completion of their goals, with respect to scuba certification.

Lesson 2

This lesson was an introduction to self-relaxation. Topics covered were:

Introduction to self-relaxation
History of progressive relaxation
Purpose of relaxation in a scuba environment

Relaxation Introduction Script

This is an introduction to progressive relaxation. The purpose of this exercise is to familiarize you with the tension that exists in your body, as well as to introduce you to the feelings associated with the relaxation response. I want you to find a comfortable place to lie or sit, so that you are comfortable and your body is fully supported. Do not cross your arms or legs. Allow them to be supported by the floor. I will turn off the lights and I want you to close your eyes and carefully listen to the sound of my voice as I describe the muscle groups and the tensing instructions. If you find that your mind starts to

wander, focus on your breathing between relaxation instructions. Do not talk during these sessions, just listen to my voice. I will start by naming a specific muscle group and then will tell you how to produce tension in these muscles. I will then direct you to produce tension and hold that tension for five to seven seconds. Then I will direct you to release that tension. When you release the tension in the muscle groups, release it completely and all at once. We will now start with the dominant hand and forearm. You produce tension in your dominant hand and forearm by clenching your fist and holding it tight. Produce that tension now . . . feel the muscles tighten in your fist and forearm . . take note of this feeling of tension . . . focus your attention on this tension. Now release that tension and relax your hand and forearm. Notice the feeling of relaxation. Let the tension dissipate and replace it with warm, pleasant, and soothing feelings. Focus on this feeling of relaxation.

Now I want you to tense these same muscles again . . . create this tension by clenching your fist . . . now. Hold that tension and notice the tightness and unpleasantness of this tension . . . focus on this tension. Hold it. Now relax . . . let all the tension out . . . experience the sensations of muscle relaxation . . . think of nothing but this pleasant feeling of relaxation.

Now I would like you to shift your attention to your dominant biceps. You will produce tension in these muscles by pushing your elbow against the floor or wall. Create this tension, now . . . feel the tension develop as you push hard against the wall with your elbow . . . focus on that tightness . . . hold that tension . . . and relax.

This sequence of tension and relaxation will be conducted for all 14 muscle groups. The muscle groups and methods of releasing tension are described below.

Muscle Group	Produce Tension By:
1. Dominant hand and forearm	clench fist
2. Dominant biceps	push elbow against floor or chair
3. Nondominant hand and forearm	clench fist
4. Nondominant biceps	push elbow against floor or chair
5. Forehead	raise eyebrows
6. Upper cheeks and nose	squint eyes tightly
7. Lower cheeks and jaw	bite down, pull lips back
8. Neck and throat	counterpoise muscle in front of neck against those of back of neck
9. Chest, shoulders, upper back	deep breath, pull shoulder blades back and together
10. Abdominal region	pull stomach in as far as possible or push stomach out as far as possible
11. Dominant leg	lift legs slightly off ground and pull toes back
12. Dominant foot	pull toes down, arch foot
13-14. Nondominant leg, foot	same as for dominant counterpart

Upon completion of the 14 muscle groups the session will be ended as follows.

Now focus on the feelings of relaxation. Concentrate on the pleasant sensations associated with this feeling of warmth and relaxation. Compare the muscles to how they felt before. Pay careful attention to these feelings of relaxation . . . now take three deep breaths, exhaling slowly . . . now stretch your arms . . . and now stretch your legs . . . feel alert and ready for swimming . . . when you are ready, you may get up and go downstairs and get ready for swimming.

Lessons 3 and 4

These two periods focused on familiarizing the subjects with relaxation. The same script as described in Lesson 2 was followed. The sequence of the sessions were as follows:

1. Muscle group was named and subject's attention was focused on that particular group.
2. Muscle group was tensed upon command of experimenter.
3. Tension was maintained for 5-7 seconds.
4. Tension was released upon signal.
5. Subjects attention was directed to the muscle group and the feeling emanating from relaxing it.

Subjects were instructed to focus on their breathing. Inhalation was to be associated with "warmth," and the long, slow, deep exhalation was to be associated with "relax." This was to aid in preventing the mind from wandering.

Lesson 5

This period stressed relaxation of combined muscle groups. The 14 muscle groups were regrouped as follows:

1. arms-shoulders
2. face-head-neck
3. back-stomach
4. thigh-calfs-feet

A cue word, "scuba," was introduced during this lesson to help associate relaxation and scuba training.

Lessons 6 and 7

Relaxation without prior tensing was covered during these lessons. The four major muscle groups were used. A consistent breathing pattern was stressed, using a long, deep, slow exhalation phase in order to simulate the recommended breathing pattern while using a regulator.

Relaxation Script

Move against the wall and assume a comfortable position. Sit or lie so that you are comfortable and your body is fully supported. Close your eyes and just concentrate on your breathing. When you breath in think "warmth," and when you exhale breath out in a long, deep exhalation. Do not be concerned if your mind wanders, just refocus on your breathing.

Now just listen to the sound of my voice as I describe a muscle group. As I describe it I want you to scan those muscles for any tension and then relax the tension. Reduce any tightness that you feel.

Turn your attention now to your arms and shoulders. Search your hand, arms, and shoulders for any tension that might exist. Scan your muscles for this tension. If you find any, relax that muscle. Reduce whatever tension that you feel . . . replace any tension with a warm, pleasant, soothing feeling of relaxation . . . just let all the tension go and think about nothing but the very pleasant feelings of relaxation.

(This procedure is repeated once again. All four major muscle groups are focused on twice each. Finally, the subjects are instructed to scan their entire body for tension and to reduce that tension.)

Lessons 8 and 9

Subjects covered during these lessons were:

Concentration
Focus of attention
Thinking with your muscles

The concept of thinking with your muscles was demonstrated using string and washers. Subjects were instructed to tie the string around the washers and create a minature pendulum. They were told to hold the string between their thumb and forefinger and to support their elbow on the table. Starting with the washer in a still position, and with no overt movement of their hands they were told to think about the washer moving from side-to-side, front-to-back, and in clockwise or counter-clockwise circles. Once the washer was moving they were instructed to try and stop it and then reverse directions.

In addition, the following concentration exercises as described by Maupin (1967) were used.

1. Sit with a straight back and relax. Let your breathing become relaxed and natural so that the movement is mainly in the abdomen. Then keep your attention focused on this movement.
2. Breathe through your mouth. Inhale as much as you require and let the air come in by distending the diaphragm. Do not draw it in, rather let it come to you. Exhale slowly and try to get all the air out of your lungs. As you exhale, count "one." Now inhale again. Then exhale slowly to the count of "two." And so on up to ten. Then repeat. You may find the counting difficult as your mind

will wander from it. However, keep at it, striving to bring your mind back to the process of counting.

3. As you are able to do the previous exercise with reasonable success, start playing the following game with counting. As you count "one" and are slowly exhaling, pretend this "one" is going down, down, down into your stomach. Think of it as being down there as you inhale and begin to count "two." Bring the "two" down and place it (in your imagination) in your stomach beside the "one."
4. A scuba tank will be placed in the middle of the room. The subjects will concentrate on this object. Concentration here does not mean analyzing the different parts of the object, or associating ideas to the object, but rather trying to see the object as it exists in itself, without any connection to other things. Exclude all other thoughts, or feelings or body sensations. Do not let them distract you but rather keep them out so you can concentrate all your attention on the tank itself.

Lesson 10

The subjects were introduced to mental imagery during this lesson. Subjects covered were:

Explanation of mental imagery
Techniques of mental imagery
Uses of mental imagery

Prior to practicing mental imagery, the subjects were given a short relaxation session.

Mental Imagery Script

The first exercise in imagery will be centered around scuba and snorkle equipment. A certain object will be named and the task is to visualize it as best you can. After the object has been named or the situation described you will be asked whether or not you were able to produce the image. If difficulty is encountered in producing images, relax yourself, and continue trying to visualize. Let it happen--do not try too hard. Some of you will find this much easier than others. Some of you will have to practice more.

I will now name some objects that you will see or feel in your mind. I want you to visualize a diving mask. Try and re-create the mask that you use in your mind. Focus your concentration on all the details of your mask.

Did any one have any difficulty producing an image? If you find it difficult to keep your mind from wandering just concentrate on your breathing, and then return to the imagery. Now I want you to imagine your snorkle. . . . Note: Imagery exercises done individually for mask, fin, and snorkle. Then the students are instructed to try and "feel" these pieces of equipment when they are worn. Finally, the subjects are told to see/feel themselves in three situations:

1) on the pool deck
2) motionless underwater
3) swimming underwater

Lessons 11 and 12

These sessions continue with mental imagery and also provide an introduction to simple mental rehearsal. Subjects are placed in a relaxed position prior to starting. A review of mental imagery was

conducted. At the conclusion of the session the class was asked to share their experiences. The situations covered were:

1) Can you visualize a Buoyancy Compensator (B.C)? Can you smell it? Can you feel it around your body?
2) Can you see a regulator? Can you see it attached to a scuba tank? Can you feel the regulator when you breathe through it?
3) Can you see yourself fully dressed in scuba gear? Can you feel the weight of the tank on your back prior to entering the water?
4) Can you see yourself entering the water?
5) Can you visualize deflating the B.C. and slowly drifting down through the water?
6) Can you visualize inflating the B.C. and slowly floating to the surface?
7) You are now underwater. Can you see yourself clear your mask? Clear your regulator?
8) Can you see yourself swimming with all your equipment underwater? Is the body streamlined? Are you breathing with long, slow, deep exhalations?
9) Picture a situation in which your diving buddy runs out of air. You are underwater and your buddy gives you the out of air hand signal. Can you picture yourself taking the correct action? Can you get face-to-face with your buddy? Can you picture the buddy breathing sequence? Can you see yourself taking two breaths and then letting your buddy have two breaths? Can you feel your controlled ascent to the surface?

Lesson 13

This lesson reemphasized progressive relaxation. The four major muscle groups were utilized without tensing. At the start of the session each subject taped a finger thermometer to his/her forefinger. After three minutes the initial temperature was noted. During the session the subjects were instructed to think about raising the temperature of their fingers. The temperature was noted at the end of the session.

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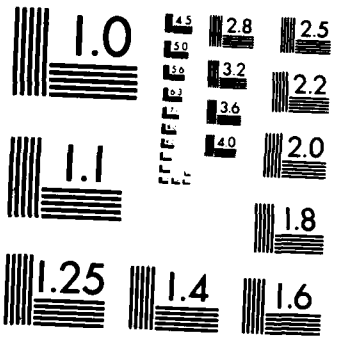


Lessons 14 and 15

These last two lessons covered mental rehearsal of the four-corner breathing test and the combination test. Subjects first assumed a comfortable position and then used self-relaxation techniques to achieve a relaxed state. Then they were instructed to perform the entire sequence of the pool performance tasks in their mind. Emphasis was placed on correct execution, as well as long, slow exhalations during the entire session.

Both tasks, which were to be rehearsed mentally, were completely explained by use of verbal instructions and diagrams placed on the blackboard. (Physical practice was not allowed due to time constraints. In addition, the training value of the tasks would be decreased if the subjects were first allowed to practice.)

Prior to mental rehearsal of the four-corner station breathing task and the combination test the subjects were told to put themselves in a relaxed state and to concentrate on their breathing. Special emphasis was to be placed on long, slow, deep exhalations. A sample mental rehearsal script is provided.

Mental Rehearsal Script

I am now going to lead you through the four-corner test. I want you to imagine or feel yourself doing the activities as I describe them. This is the same process you can do yourself at home or in your dorm.

Imagine that you are down on the pool deck. You are standing so that you are looking into the diving well. You can see four scuba tanks in each corner of the diving well. Imagine or feel yourself

enter the water with your fins on. Now put your mask on. You must now imagine that you are ready for your test. You take a deep breath and surface dive to the first tank. When you reach the tank imagine or feel yourself taking two breaths from the regulator. When this has been done, take the regulator out of your mouth and swim over to the next tank. Imagine yourself to be swimming confidently and surely over to the next tank. As you swim feel yourself being powered by your legs. When you reach the next tank, again take two breaths from this regulator. Now imagine yourself swimming to tank three and four repeating this process. (Pause)

Now imagine yourself taking your mask off and placing it at the bottom of the pool. Imagine yourself now swimming to each of the four tanks. As you swim imagine or feel the water pushing against your face. Imagine yourself swimming confidently to each tank and taking two breaths and then swimming on to the next tank. Upon coming to the fourth tank, and after breathing from the regulator, surface.

Once you reach the surface, imagine or feel yourself putting on a black-out mask. This mask will prevent you from seeing anything. Feel yourself entering the pool at the corner. Feel yourself holding on to both edges. When you are ready, you will feel yourself take a breath and surface dive to the bottom of the pool. Imagine keeping your hands in contact with the walls at all times. When you reach the tank, search for the regulator and then take two breaths. Now imagine yourself moving to the other three tanks. Imagine keeping one hand on the bottom and one on the side of the pool. After coming to the last tank, surface and get out of the pool.

Once you have done this I want you at your own pace to mentally rehearse the entire sequence again. Try and remain relaxed, at any time if you feel any tension, reduce that tension and then continue. This technique can be practiced at home, as well.

The four-corner test was mentally practiced on the 14th lesson, and the combination test was mentally rehearsed during the 15th and final session. The subjects were encouraged to practice the techniques they had been taught and familiarized with during the remainder of the scuba course. In addition, other uses were pointed out such as an aid to falling asleep, tension reduction during a test or while driving, and any activity they engaged in which increased their anxiety.

APPENDIX C

ANOVR AND ANOVA SUMMARY TABLES FOR SELF-REPORT MEASURES

Table 10

Summary table: ANOVR, state anxiety

Source	Adjusted df	MS	F	Probability
Treatment Differences (Between Subjects)	1	2350.65	13.355	<.001
Error	55	176.01		
Within Subjects				
Performance Tests	3	1994.58	55.755	<.001
Interaction	3	235.10	6.572	<.001
Error	142	35.77		

Table 11

Summary tables: Pretreatment ANOVAs for A-trait and CSAQ

Source	df	MS	F	Probability
		STAI A-TRAIT		
Between Groups (A)	2	319.35	7.10	.0014
Error	85	44.98		
		CSAQ COGNITIVE SUBSCALE		
Between Groups (A)	2	1117.95	12.34	.00001
Error	85	90.59		
		CSAQ SOMATIC SUBSCALE		
Between Groups (A)	2	318.44	4.36	.0157
Error	85	72.98		

APPENDIX D

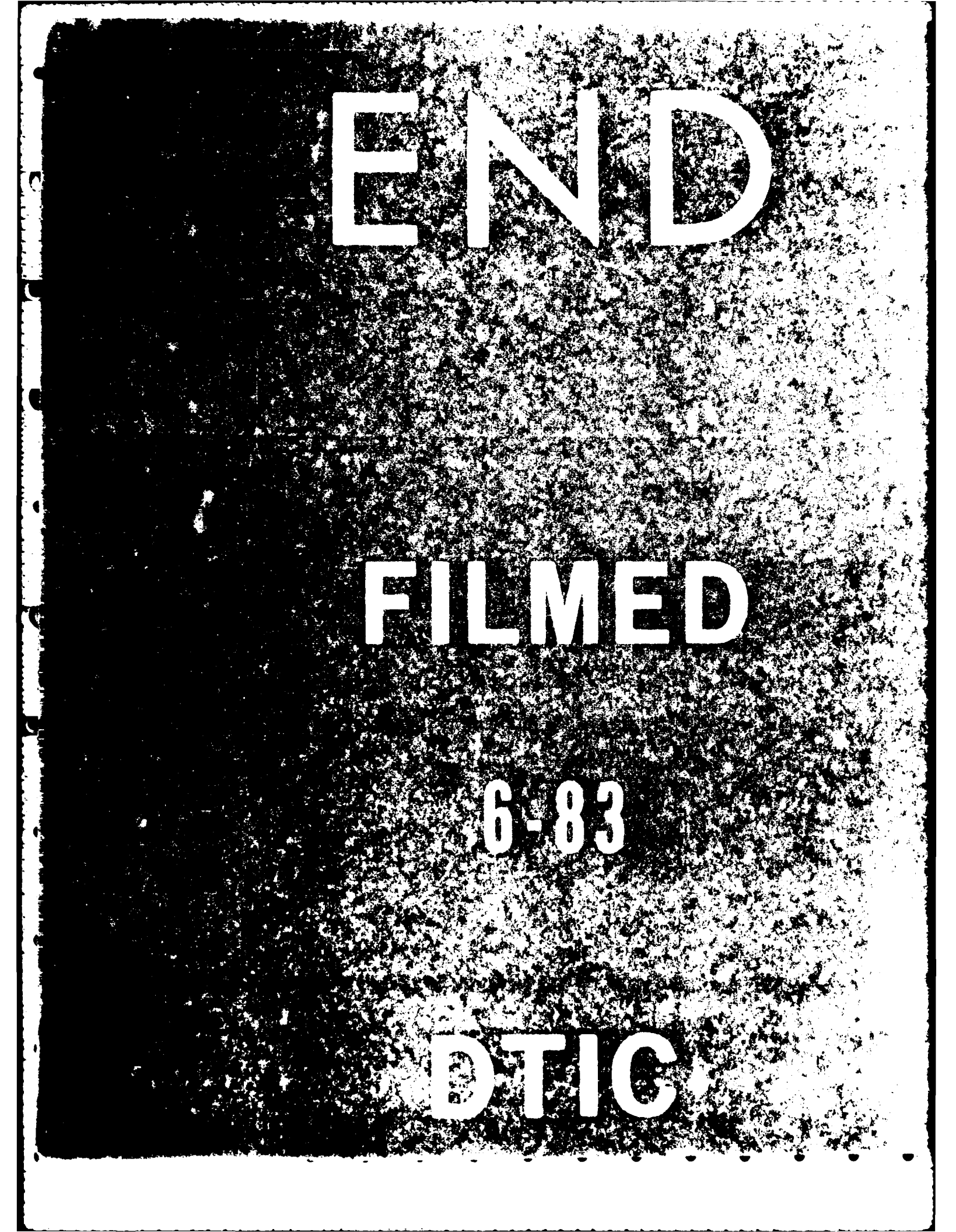
VARIANCE-COVARIANCE MATRICES OF A-STATE SCORES

Experimental Group

	Dive 1	Dive 2	Four-Corner	Combination Test
Dive 1	39.99			
Dive 2	23.54	63.45		
Four-Corner	42.84	37.80	150.72	
Combination Test	41.31	37.15	80.03	106.10

Control Group

	Dive 1	Dive 2	Four-Corner	Combination Test
Dive 1	21.40			
Dive 2	18.39	46.56		
Four-Corner	20.32	25.99	66.76	
Combination Test	15.26	33.12	34.50	55.28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